Published by the
American
Psychological
Association

Special Issue on behavioral developmental approaches to clinical interventions

BEHAVIORAL DEVELOPMENT BULLETIN

bao JOURNALS

Volume 19 | Number 2 | July 2014

ISSN 1942-0722

WWW.BAOJOURNAL.COM

BEHAVIORAL DEVELOPMENT BULLETIN

A Behavior Analysis Online Journal & An American Psychological Association Publication

VOLUME 19 NUMBER 2 JULY 2014

Governing Board: Behavior Analysis Online Journal
Published by: American Psychological Association
Volume 19, 2014

» MANUSCRIPT SUBMISSION

Please submit manuscripts electronically via email to the editors.

- Michael L. Commons: commons@tiac.net
- Martha Pelaez: martha.pelaez@fiu.edu

Guidelines for submission are available on the following webpage:
http://www.baojournal.com/BDB%20WEBSITE/Submissions.html

» MISSION STATEMENT

As of July 1, 2013, the *Behavioral Development Bulletin* (BDB) has become an *American Psychological Association* (APA) publication and is governed by the *Behavior Analysis Online* (BAO) Journals. The editors are Michael Lamport Commons and Martha Pelaez. The BDB is about what causes and organizes behavior and how those causes and organization can explain the world. We continue to be interested in submissions that are intersections of behavioral methods and development. The articles are not to be interpretative, humanistic or metaphorical.

The mission of the *Behavioral Development Bulletin* (BDB) has been to provide developmental psychologists with peer reviewed scientific information of interest. BDB informs the field of developmental psychology by taking a behavioral analytic approach, including research in cognitive development, child emotional development, developmental theory, and socialization. The journal has three goals. The first is to understand human development in behavioral terms. The second is to reach out to developmental psychology with the innovations that behavior-developmental approaches have provided. The third is to publish behavior analytic interventions that measure and promote development and change. This means that we are interested in educational and clinical interventions that stimulate and increase the likelihood of development. The topic of the measurement of development includes elucidating what the sequences of development are in different areas.

Since its inception in 1991(M. Pelaez, Editor), the journal has published articles of an inter-and-multidisciplinary nature including areas of socio-biology, verbal behavior, and behavioral methodology. The BDB is especially relevant to behavior analysts who study learning and the developmental processes responsible for behavior changes and their progressive organization. The BDB hopes to provide answers by looking at the biological and environmental factors and systems that affect behavioral development, while maintaining primarily interest in the role of reinforcement and environmental contingencies that influence behavior change.

The journal also has six special sections

1. The Special Section on *Behavioral Assessment and Intervention in Children* provides information on critical issues and research in early intervention and intensive behavioral interventions.
2. The Special Section on *Developmental Approaches to Clinical and Counseling Psychology* focuses on clinical issues from a behavior-developmental perspective.
3. The Special Section on *Behavior-developmental Based Education* also examines educational issues behavior-developmental perspective.
4. There is a Special Section on *Positive Adult Development* from a behavior-developmental perspective.
5. Precision Teaching and Celeration
6. The Journal of Speech - Language Pathology and Applied Behavior Analysis

In addition to regular submission, we welcome suggestions and submissions for special issues on behavioral developmental topics. In the past, there have been many special issues, including the Special Issue on Reactive Attachment Disorder, Special Issue on Genes and Development, and The Model of Hierarchical Complexity.

Contents

Preface

Michael Lamport Commons, Editor
Harvard Medical School

This issue of the *Behavioral Development Bulletin* (BDB) includes studies about behavioral developmental approaches and instruments for clinical settings. Approaches include Developmental Behavior Analytic Therapy (DBAT), Multiple Exampler Instructions and, Implicit Relational Assessment Procedure (IRAP). Measures include teaching tool IRAP (T-IRAP) and Student Bully Problem. The issue also includes a study that presents a theoretical risk factor model explaining why some celebrities have downfalls and another article that reviews self-control training from a contextual behavioral science standpoint.

The opening article by Commons and Tuladhar introduces the Developmental Behavior Analytic Therapy and its theoretical underpinnings. It is the first therapy that takes into account the significance of changing developmental stage and value of outcome of behaviors in individuals to being about behavioral change. The next article is a sequel that lays out the sequence of procedures of the therapy and discusses 6 case studies applying DBAT. The third article by Lovett and Rehfeldt investigated the effects of Multiple Exemplar Instruction for teaching perspective-taking skills to young adults with autism. New (VB-MAPP) and individual relational training requirements was investigated. The fifth article by Scanlon, McEnteggart, Barnes-Holmes and Barnes-Holmes comprised two studies that explored the utility of the Implicit Relational Assessment Procedure (IRAP) as a measure of children's implicit attitudes to the self. It highlights the benefits of using both explicit and implicit measures, especially the IRAP, when assessing the implicit cognitions of children. In the next study by Kilroe, Murphy, Barnes-Holmes and Barnes-Holmes, IRAP was adapted as an interactive teaching tool (T-IRAP) targeting relational frames with four children diagnosed with autism. It showed that the T-IRAP was successfully adapted to teach all targeted relations, and in general, greater speed and accuracy in relational responding were shown during T-IRAP teaching compared with Table-Top teaching. The seventh study by Joaquim used the Student Bully Problem, an assessment of cognitive developmental stage adapted from Commons et al.'s (2006) Counselor-Patient Problem, and found that the instrument was useful in assessing cognitive developmental stage of performance in reasoning about bullying in school age youth. The eighth study by Commons, Commons-Miller, Salaita and Tuladhar, introduces a model explaining what leads stars to crash and assesses risk factors in a sample of 18 celebrities who have had downfalls. It theorizes that individuals' early environments and social forces, such as assortativeness and affiliation, contribute to their narcissistic traits. The model illustrates how these risk factors including narcissistic traits and the adult environments of stars lead them to engage in behaviors that lead to their downfalls. The final article by Mckeel and Dixson is a review of self-control from contextual behavioral science stand-point. It evaluates the types of training and assessments involved in measuring self-control, and future directions of self-control training and choice making.

Lastly, I would like to thank my co-editors, associate editors, reviewers and managing editor for their help in putting this issue together. ■

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Developmental behavior analytic therapy: Easier done than said

Michael Lamport Commons[1] and Charu Tara Tuladhar[2]

1 Department of Psychiatry, Beth Israel Deaconess Medical Center, Harvard Medical School
2 Dare Institute

ABSTRACT

Developmental Behavior Analytic Therapy (DBAT) is the first behavioral therapy with developmental underpinnings. This paper introduces DBAT by presenting a composite case study. It also discusses the theoretical underpinnings of this therapy. DBAT aims to help individuals with behavioral problems change specific problem behaviors that consequently help them to lead more satisfying lives. It aims to alter specific behavioral problems, because the biological susceptibility to such behavioral problems is a given. It is suggested that this therapy be used as an adjunct to conventional therapies that specialize in helping individuals cope with behavioral problems. DBAT is different from other contemporary or behavioral analytic therapies, as it integrates a behavioral developmental stage model, the Model of Hierarchical Complexity (MHC), into its working. The foundation of this therapy is the theory that behavioral developmental stages and value of consequences of a behavior interact to predict an individual's behavior, and also suggests that behavioral problems affect both behavioral developmental stage and value of consequences.

KEYWORDS: behavioral development, therapy, individualization of behavioral requirements within task sequence, reinforcement, action, behavioral disorders, value of consequences and its discounts, model of hierarchical complexity

I was a 22 year old research assistant, who had recently graduated from college with an above average grade point average (GPA). While he was in college, he did not assume ownership of his work. He did his assignments for classes, because he was required to do them, and not because he chose to do them to advance his professional aims. One might say that he lacked motivation on the surface. Below the surface, he seemed to lack dreams and goals. Following graduation, he took a year off and worked as a research assistant, more as a default position than to advance his career. To him, it was the most interesting job he could find. He also considered that it might improve his chances of getting into graduate school if that was what he decided to do in future. When he started work, he did not understand that work and school are different realms. In the beginning, he was disinterested and was working in a perfunctory manner. He wanted to attend graduate school, but he was unsure in what field. He was vague about his long term career goals. He thought he might want to do research in human development. However, he had no knowledge regarding the skills and qualities required to be a researcher, nor was he aware of the processes involved. He was unaware of his career choices. Consequently, he did not know the path to attain his career goals. His work habits were poor, and he lacked research experience. His productivity was very low. Moreover, he did not have a clear sense of a time frame to accomplish his goals. His work goals were not being prioritized. He was very risk aversive. He doubted his abilities, and was not confident that he could get into a graduate school. He avoided activities such as studying for the Graduate Record Examination (GRE), presenting and publishing—all of which would have helped him move towards achieving his goals. He knew very little about the politics involved in academia, as he seemed oblivious to the political nature of the world. He did not think about social relationships in a very mature way. He was able to take the perspective of others, yet often failed to see the interconnections between different variables. He thought that doing just what was required in everything was enough. He did not realize that such behavior might interfere in achieving his goals by keeping him from going further in his education. He was not aware of the political intricacies that exist among people, culture, and academia. He could not comprehend that the path to his goal would not be linear. Thus, he tended to obsess and fret (realistically) about his prospects for success.

Correspondence regarding this article should be addressed to Michael Lamport Commons, Ph.D., Harvard Medical School, 234 Huron Avenue, Cambridge, MA 02138, commons@tiac.net, (617) 497-5270.

The authors would like to thank Dr. Thomas Gutheil, Dr. Graham Spruiell, Dr. Alice LoCicero, Dr. Richard Wallstein, Dr. Sharon McNamara and Dr. Richard Goldberg for reviewing this article. They would also like to thank Mr. William Joseph Harrigan and Mr. Sagun Giri for their help in copy editing the article.

Many conventional therapies might focus on J's emotional reactions as the basis of his uncertainty about his future and lack of motivation. For example, psychodynamic therapy might help him become conscious of repressed conflicts and emotional reactions involved that were inhibiting his capacity to work (Corsini & Wedding 2008). A psychodynamic psychotherapist would help the patient become aware of unresolved conflicts as an explanation for his current difficulties, assuming that the nature of conflict is repeated in the repetition compulsion. What J could not recall, he was repeating. For example, consider a situation in which J had an unconscious conviction that attending graduate school or attaining success in any other arena would most certainly result in his complete humiliation and demise, perhaps even annihilation. Then the basis of his hesitation, that is work inhibition, would become knowable and interpretable. The treatment would assist J—by helping him to make repressed conflicts regarding losses and traumas conscious; and further to help him realize the role of such conflicts in his current difficulties. In this way psychodynamic psychotherapies would help J develop insight about his work inhibition (Corsini & Wedding, 2008). However, merely developing insight about work inhibition is not enough to bring about behavioral change.

Besides intrapsychic insight as the one explained above, there may be another insight essential to behavioral change, which is the insight about what causes other individuals to respond to the patient in a characteristic way. Psychodynamic therapy does not address this different level of insight. Most individuals with behavioral problems tend to lack insight into other people's behaviors towards them (Kegan, 1982). The lack of insight is understood in terms of social perspective taking resulting in a lack of intimate relationships (Commons & Rodriguez, 1990). In the case study presented above, it is important to take into consideration that J's problems were not simply associated with his emotional reactions or lack of intrapsychic insight into his own behavior. His problems were also due to inaction. When he did act, his actions failed to meet the task requirements necessary to obtain reinforcement in the present. An example of inaction would be J's tendency to avoid actions that would move him closer to getting into graduate school. He refused to study for the GRE. He did not present papers, nor publish. Part of overcoming his problem of inaction is he learns that he has a problem. J would need behavioral interventions that would help him move towards a career path and acquire knowledge and skills necessary to do so. Psychodynamic therapies, however, do not typically include behavioral interventions.

Cognitive Behavior Therapy (CBT), its myriad of variations, is a behaviorally oriented therapy. CBT includes a range of behavioral methods, such as self-monitoring, behavioral activation, behavioral experiments, exposure therapy, and skills training (Farmer & Chapman, 2007). Although CBT includes behavioral interventions, it is more focused on altering one's maladaptive thoughts. Cognitive behavior therapists hold that altering one's maladaptive thoughts will consequently change maladaptive emotional responses and behaviors as well (Lambert, Berg & Garfield, 2004). The behavioral interventions included in CBT, however do not address two crucial aspects of individuals that are important in changing a problematic behavior: their developmental stage and their valuation of outcome of a behavior, i.e. their assessment of pleasure versus displeasure.

Psychoanalysis and CBT are not the only therapies that do not incorporate developmental stage into their working. Dialectical Behavior Therapy (DBT) is an expansion and extension of CBT. It does include valuation of outcome of a behavior as it uses contingency management to change behavior (Linehan, 1987). However, the therapy does not incorporate developmental stage. Acceptance and Commitment Therapy takes the overall value of an individual's interests into consideration. It does so by clarifying what is important to the way one desires to live life (Springer, 2012). Unlike CBT, ACT does not aim to change an individual's negative thoughts. Instead, it helps individuals accept their inner states and thoughts as they are from a neutral perspective (Springer, 2012). It looks at the development of social perspective taking. But is does not consider what developmental stage one is performing at on specific tasks.

Most contemporary behavior therapies also do not directly examine the developmental sequence of operants to help individuals perform the behavior with which they are struggling. They are more geared towards extinguishing anxiety and fear from past punishments. They use techniques such as *desensitization* and *extinguishing* to help individuals overcome fear, anxiety or aversion of stimuli that hinder an individual from performing a certain behavior (Head & Gross, 2009; Mystkowski & Mineka, 2007).

Basseches and Mascolo (2012) suggested that all successful therapies promote developmental changes in forms of acting, thinking and feeling in order to produce adaptive changes. They point out the importance of developmental change that takes place in successful psychotherapy. However, there has been no behavioral based therapies that incorporate a developmental stage model into its most of its working.

It is important to understand how developmental stage affects one's behavior. From a developmental perspective, J's behavioral developmental stage contributed to his lack of understanding the nuances of relationships with other people, for example political relationships among people, culture and the environment. This prevented him from successfully pursuing his career goals. In order for J to understand these relationships better, J would need to be able to move towards a higher behavioral developmental stage. Because the reinforcement J would get from taking the necessary steps to achieve his goal was not an immediate one, the value of the reinforcement he would get from those desirable behaviors was not very high. This kept him from engaging in such behaviors. How developmental stage and value of outcome of a behavior affect behaviors of individuals will be discussed in detail in the following sections of this paper.

Unlike other contemporary and behavioral analytic therapies, Developmental Behavior Analytic Therapy (DBAT) was developed incorporating behavioral developmental stages and value of reinforcement of a behavior. DBAT is the first behavioral therapy that incorporates a developmental behavior model, the Model of Hierarchical Complexity (MHC). It aims to change problematic behaviors by helping individuals to raise their behavioral developmental stage in those particular problem behaviors and to alter their values of reinforcement of the desired behaviors. Whereas DBAT may be effective in treating behavioral problems, it does not claim to alter an individual's biological susceptibility to be-

havioral problems; it simply aims to help an individual change certain problem behaviors. We suggest that this therapy be used as an adjunct to conventional therapies, because this therapy only focuses on certain problematic behaviors. If one of J's problem behaviors was not getting things together for graduate school applications because of his anxiety associated with it, DBAT would help him change that specific problem behavior. DBAT would not directly focus on reducing the anxiety he experienced in applying to graduate school nor will it work on reducing his general anxiety on other activities. While J undergoes DBAT to change a certain problem behavior, he could also undergo relaxation therapy or other CBT aimed at helping him deal with particular behavioral problems related to GAD. Thus, this therapy may be an effective adjunct therapy. In the following sections of this paper, the authors discuss the theoretical underpinnings of DBAT and present how DBAT would analyze J's problem behaviors.

» THEORY BEHIND DEVELOPMENTAL BEHAVIOR ANALYTIC THERAPY

The core foundation of this therapy is our theory that behavioral developmental stages and valuation of consequences of behavior interact functionally to predict an individual's behavior, and that behavioral problems affect both *stage* and *value of consequences* including how it is discounted. We explain these relationships in this section. Action can be understood from the perspective of behavioral developmental stage and value. To understand the development and framework of the concept of this therapy, it is important to understand the Model of Hierarchical Complexity on one hand and valuation of reinforcement of outcomes on the other hand. The interaction between these two variables and how they are affected by behavioral problems are crucial to outcome behavior.

Model of Hierarchical Complexity

The Model of Hierarchical Complexity (MHC) is a measurement theory that analyzes the developmental difficulty of tasks represented by the *Orders of Hierarchical Complexity*. It represents the behavioral developmental stages at which an individual is performing while completing a task (Commons & Pekker, 2008; Commons & Richards, 2002A, 2002B; Commons, Trudeau, Stein, Richards & Krause, 1998). Commons, Gane-McCalla, Barker and Li (in press) formally described the model explaining its operations and axioms. Commons et al. (in press) also gave empirical and mathematical confirmation that the stages of development in MHC have gaps and that they are equally spaced. A scoring manual for MHC was developed by Commons, Miller, Goodheart and Danaher-Gilpin (2005). The MHC has also been broadly applied to many domains such as social perspective taking (Commons & Rodriguez, 1990, 1993), informed consent (Commons et al., 2006), political development (Sonnert & Commons, 1994), nature of good work (Armon, 1993), good education (Dawson, 1998), views of the "good life" (Armon, 1985; Dawson, 2000), epistemology (Kitchener & Fischer, 1990; Kitchener & King, 1990), moral judgment (Armon & Dawson, 1997), balance beam and pendulum tasks (Commons et al. 2008), hominid empathy (Commons & Wolfsont, 2002).

Order of Hierarchical Complexity characterizes the underlying difficulty of tasks. The successful completion of a task at a certain Order of Hierarchical Complexity indicates the individual is performing at the stage that has the same number and name as that Order of Complexity (Commons et al., 2008, Commons et al., 2002). The higher the Order of Hierarchical Complexity, the greater the difficulty of the task. Table 1 presents the 16 Orders of Hierarchical Complexity, their examples and descriptions.

The core of the model is task analysis. The higher-order task *coordinates* the tasks of the *next lower* order. There are three conditions that need to be met for this: ***a)*** higher-order task is defined in terms of two or more tasks at the next lower order of Hierarchical Complexity; ***b)*** higher-order tasks organize the less complex actions; that is, the more complex action specifies the way in which the less complex actions combine; and ***c)*** the lower order tasks have to be carried out *non-arbitrarily*, not just put together as an arbitrary chain (Commons & Pekker, 2008). For example, to be able to say or learn words, one has to have learned communication through gestures and reading gestures and emotions of others. Otherwise, one gets parroting that misses the emotions and gesture. This is often seen in people with mid functioning autism, who repeat words or phrases from commercials. One also has to first learn phonemes and then morphemes associated with those words. This is carried out non-arbitrarily as one has to first learn phonemes and then morphemes and not the other way around.

This model is significant to behavioral change because behavior of a person is affected by the stage at which a person performs. Stages are domain specific. Consequently, a person's stage of performance may vary among domains. For example, one may perform at stage 12 at work, but may perform at stage 9 when it comes maintaining one's relationship with a spouse. Behaviors that are problematic are usually a result of performance at a lower stage than required in that particular behavior. Performance at a higher stage usually results in more satisfying behavior. The current paper incorporates the MHC and the effect of stage on behavior into the workings of DBAT. The success of this therapy is dependent on the developmental behavior analyst's (DBA) ability to identify and raise the behavioral developmental stage at which the advisee functions when engaging in the behavior of interest.

Value and its discounting

In addition to behavioral developmental stage, the success of DBAT also depends on whether DBAs are able to help individuals adjust their values of outcome behaviors to achieve the desired target behavior. Commons, Ross and Bresette (2011) theorized that besides stage, value of an outcome behavior is the other variable that influences behavior. There are four forms of valuing and its discounts (Commons, Grotzer, & Davidson, in press, Commons et. al, 2013).

a) First, is the value of the reinforcing consequence of behavior. It is measured by sensitivity to that reinforcement. Sensitivity to reinforcement of a behavior can be measured by presenting choices of reinforcement to people and having them rate the value of the reinforcements. The different sensitivities are most likely due to an interaction between genes and environment. Some of these differences appear on interest assessment (Campbell, 1974; Strong,

Table 1. Orders of Hierarchical Complexity, its description and examples

Order	Name	Description	Examples (verbal/physics)
0	Calculatory	Machines can do simple arithmetic on 0s and 1s.	All the software is programmed in by programmers, and the designers of the programs.
1	Sensory & motor actions	Infants may see or touch shapes, make generalized discriminations, as well as babbling vocalizations.	Either seeing circles, squares, etc. or instead, touching them.
2	Circular sensory-motor actions	Reaching and grasping object they see. These actions generate simple gestures.	Reaching and grasping a circle or square.
3	Sensory-motor	The actions become associated with vocalizations. Concepts of shape and color built out of reaching for object they see with common properties.	An infant may hold up an object and make sounds while doing so.
4	Nominal	First single words are formed as representations of concepts.	Words such as "cup" or "water" relate concepts to others. The word "one" may be said
5	Sentential	Toddlers form short sentences and phrases. The use of pronouns develops, and a few numbers and letters are said in order as well.	Sentences might be "want water," "cup of water," etc., responding differently to "hit ball and "ball hit"
6	Pre-operational	Sentences formed at stage 5 (Sentential stage) are organized into paragraph long utterances. Counting of objects in a line but with failure to stop when the last object has been given a number.	Tell parts of stories made out of sentences. These can be real or fanciful.
7	Primary	Paragraph long utterances are organized into stories which may be matched to reality.	Can follow orders told to them in story form. Can carry out a relatively long sequence of actions told to them to carry out. Counts accurately to large numbers
8	Concrete	Two primary stage operations may be coordinated. Counting, adding and multiplying allow for long multiplication and long division.	Children think that a deal is fair after looking at from the perspective of simple outcomes for each person who is entering the deal. Negotiations make sense but there are not social norms for setting prices or values.
9	Abstract	Variables, stereotypes, personalities, traits, etc. are introduced. The dimensionalized qualities may be used to express preferences. Calculate price when the formula only has to have the values of the variable filled in.	Quantification words like "everyone in my group," What would other's think?" appear.
10	Formal	Discussions are logical and empirical support is logically brought. Solves univariate equations.	Words like "if . . .then," "in every case, it turned out the same," "the reasons were" occur.
11	Systematic	The new concepts are referred to as 3rd order abstractions. These coordinate elements of abstract systems.	Words like bureaucratic, capitalist, functional, and structural are common. The systematic stage concept, structure, for example, can be employed to ask whether the structure of camp helps instill the qualities we want in future citizens. The logical structure of this stage coordinates multiple aspects of two or more abstractions, as in: "relationships are built on trust and though we cannot always keep them, making promises is one way we build trust, so it is generally better to make promises than not to make them." Here, the importance of trust to relationships, building trust, and the possibility that promises can be broken, are all taken into account while formulating the conclusion that promises are desirable.
12	Metasystematic	The new concepts are referred to as 1st order principles. These coordinate formal systems.	Words like autonomy, parallelism, heteronomy, and proportionality are common. The metasystematic stage concept of parallelism, for example, can be employed to compare the structures of the military and of camp as institutions. The logical structure of this stage identifies one aspect of a principle or an axiom that coordinates several systems, as in: "contracts and promises are articulations of a unique human quality, mutual trust, which coordinates human relations." Here, contracts and promises are seen as the instantiation of a broader principle coordinating human interactions.
13	Paradigmatic	People create new fields out of multiple metasystems. The objects of paradigmatic acts are metasystems. When there are metasystems that are incomplete and adding to them would create inconsistences, quite often a new paradigm is developed. At the cross-paradigmatic, paradigms are coordinated.	An example is the wave equation as it is derived by coordinating the three metasystems: Newton's law of motion, the Continuity Equation and the Ideal Gas Law.
14	Cross-paradigmatic	Cross-paradigmatic actions integrate paradigms into a new field or profoundly transform an old one. A field contains more than one paradigm and cannot be reduced to a single paradigm.	An example is string theory as it combines quantum physics and the theory of general relativity.
15	Meta-cross-paradigmatic	Metacrossparadigmatic actions reflect on various properties of crossparadimatic actions seeing with the crossparadigms are consistent, possibly true and determining other properties of crossparadigms.	Show that String Theory and Membrane Theory are incomplete because they do not account for dark matter and dark energy.

1943). The perceived value of reinforcement of a behavior affects the frequency of that behavior. If the value of the reinforcement of a behavior is high, the likelihood of that behavior occurring is greater, whereas if the value of reinforcement of a behavior is low, the likelihood of that behavior occurring is low. For example, consider achieving good grades as the reinforcement obtained through the behavior of good study habits. If getting good grades is of high value to a student, the likelihood of the student maintaining the good study habit is greater. However, if getting good grades is not of high value to a student, the likelihood of the student developing and maintaining a good study habit is low. The rate of behavior at all times is directly proportional to the obtained rate and value of reinforcement of behavior action (Herrnstein, 1970).

b) A second factor, is discounting, which refers to the process by which a reinforcement loses its value or effectiveness with delay between the behavior and the consequential reinforcement. In other words, discounting occurs when reinforcers received in the far future are worth less than reinforcers received in the present. Discounting decreases the likelihood of the behavior occurring as the value of the reinforcement decreases due to delay between the behavior and consequential reinforcement. In more popular parlance, this is often referred to as impulsiveness or the "inability to delay gratification." For example, consider a person who chooses to party with his friends one night instead of using that time to prepare for his job interview the next day. In this case, he discounted the reinforcement he might get by preparing for his job interview and possibly getting the job. He chose the immediate pleasure he would get from partying with his friends over the possible delayed reward he would get by preparing for his interview and doing well in it.

c) A third factor, is risk. It is represented by how sensitive an individual is to a change in delay of reinforcement or punishment. Risk is usually associated with an increase in delay. To obtain a desired behavior, the perceived risk may have to be increased or decreased depending on how the risk affects the behavior. High perceived risk leads to avoidance of behavior and low perceived risk leads to continuation of behavior. For example, consider students who avoid taking writing intensive classes. They perceive the risk of their papers being critically evaluated by the teacher to be very high. Although this may hinder them from attaining their undergraduate degree, because their perceived risk of taking a writing intensive class is very high, they avoid the behavior. In this case, the perceived risk has to decrease. Consider another example of hoarders who have their yards full of garbage, old cars, broken compressors, and old building material. The perceived risk of bothering the neighbors so that they call the health department by collecting unnecessary goods is low. Thus they continue to hoard goods and cause trouble in the neighborhood. In this case, in stopping them from hoarding goods, the perceived risk has to increase.

d) The fourth factor is cost, which represents the change in value of reinforcement. Costs are negative consequences of problem behavior or the lack of behavior. Problem behaviors persist as people misjudge the cost of such actions or inaction. Inaction is often thought to be different from action. However, inaction is inhibition of action which, in itself, is an action. Both inaction and problem behavior change when people understand the cost of such behaviors.

Interaction between stage and value

Value of an outcome (reinforcement or punishment of a behavior), as well as the discounting of that value over time, is affected by an individual's stage of development. Stage and value are related to each other in numerous ways (Commons, Grotzer & Davidson, in press; Commons & Barry-Heffernan, 2012).

First, the stage of understanding of the *contingencies* between one's own behavior and the consequences of that behavior may affect which behaviors one engages in. Contingencies are the rules for delivering reinforcers and punishers. Effective contingencies either maintain or alter a behavior. Contingency is the relationship between the stimulus cue, the response behavior and the reinforcement of that behavior (Skinner, 1969). Some contingencies are simpler, such as, being given a sticker for behaving well. Some contingencies are more complex, such as, the contingencies involved in creating a fairer social group. Individuals who appreciate complex contingencies may be more likely to behave in ways that bring long term benefits to themselves and others (Commons & Heffernan, 2012). Thus, the behavior of acting in ways that bring more long term benefits obtains more value. Such individuals, who appreciate complex contingencies, discount the value of future reinforcements less often because the value of those future reinforcements increases. Thus, individuals who perform at a higher stage tend to appreciate complex contingencies, whereas, individuals who perform at a lower stage tend to appreciate simple contingencies. Individuals who perform at a high stage also discount less.

For example, if students performing at a low stage have an exam to study for, the value of the immediate reinforcement they get from watching television instead of studying would be high due to discounting. They would find watching television more reinforcing than studying for the exam. They would discount the value of future reinforcement of performing well in the exam and choose to watch television instead of studying. However, if the students are performing at a high stage, they would not discount the value of reinforcement for what they would get in the future. Studying and performing well in the exam would be more reinforcing to them than the immediate reinforcement they would get from watching television.

Another example can be drawn from the following scenario. If an individual siting five feet away had a finger on a dooms day button that when pressed would blow up the world, would one shoot that person (L. Kohlberg, personal communication, 1987). If one places emphasis on the simple contingency such as not killing a person is the moral thing to do, one would discount the complex contingency of killing a person to save the world. An individual performing at a low stage would pay attention to the simple contingency and would not kill the individual with a finger on the dooms day button. However, an individual who performs at a high stage would understand complex contingencies and would kill the person to save the world. The reason for the discrepancy between individuals who perform at higher and lower stage in understanding contingencies could be that individuals who perform at lower behavioral developmental stages have been associated with toleration of shorter delays in reinforcement (Mischel, Shoda & Rodriguez,

1989). In addition, people who perform at a higher stage are also better able to assess the risk and cost of behaviors with short term reinforcement.

Second, high reinforcement value of an outcome affects stage. If high reinforcement is contingent upon a high stage behavior, individuals come to perform at a high stage. For example, individuals with higher income perform at a higher stage. This can be inferred from a study done to assess the relationship between peddlers' income and the developmental stage at which they performed (Commons-Miller, Commons, Li, Miller, Golino, Tuladhar, 2012). The study showed that stage and income are positively correlated ($r(53) = .506$, $p < 0.05$). High income has high reinforcement value. High reinforcement value motivates individuals to work in higher stages. Thus, when individuals obtain high reinforcement for performing at higher stages, they demonstrate high stage behavior.

Likewise, if high reinforcement is contingent upon a low stage behavior, individuals perform at a low stage. For example, when people are bribed with a large sum of money, they may act in unwise or immoral ways. A large sum of money is a reinforcer of a large value; acting in immoral ways is a lower stage behavior. An example of a situation in which a person may choose to perform at a low stage due to a large value of reinforcer can be drawn from the movie, *Indecent Proposal*. In the movie, David and Diana are a happily married couple who go broke and lose their house. A billionaire John Gage offers David a million dollars for a night with his wife, Diana. David and Diana ultimately decide to take the offer. In this situation, David and Diana were in great need of the money. A million dollars was very high in value for them. Hence, they chose to engage in a low stage behavior. Thus, when high reinforcement is contingent upon a certain stage behavior (high or low), individuals tend to perform at that stage.

Third, low reinforcement value may prevent individuals from performing at a high stage. For example, a behavior that evokes anxiety has low reinforcement value. The low reinforcement value of the anxiety provoking activity prevents people from performing that behavior.

Behavioral problems

A pattern of behaviors including rumination, avoidance, self-medication, dissociation, denial and its stronger form—"negative delusion" emerges among people with behavioral problems. This pattern in turn affects individual behavioral developmental stage and value of outcome of a behavior. There have been studies that have shown that most people with a behavioral problem tend to ruminate about their problems. For example, people who have gone through a traumatic event or significant loss ruminate. Rumination, thoughts about past events, as well as anxiety about possible danger in future, has been suggested to be both a symptom of posttraumatic stress disorder (PTSD), and also an important maintaining factor of PTSD (Ehlers & Clark, 2000). Studies have shown that there is a positive correlation between severity of obsessive compulsive symptoms and obsessive rumination, even after controlling for depression (Wahl, Ertle, Bohne, Zurowski, & Kordon, 2011). Similarly, people who score high on covert narcissism tend to have high levels of expected rumination (Atlas & Them, 2008).

Individuals with behavioral problems also experience negative delusions. They do not apprehend negative consequence or the cost of the problem behaviors they engage in. They often do not appreciate the cost of their inactivity, having a negative delusion about the passage of time itself. There also oblivious to the pleasure of their achievements. In some cases, even if they do understand the costs, they are not able to inhibit those behaviors, because they only respond to short term reinforcements, and they heavily discount behaviors eliciting long-term reinforcement. This observation is especially true for people with personality disorders. For example, Coffey, Schumacher, Baschnagel, Hawk and Holloman (2011) showed that impulsivity and discounting of delayed reinforcement was significantly greater in participants with BPD than participants who did not have BPD or participants with substance abuse disorders. Negative delusion leads to the continuation of problem behavior. A number of individuals with behavioral illness also engage in avoidance of anxiety provoking behaviors, since avoidance gets negatively reinforced. This approach becomes problematic when those anxiety provoking behaviors are important to those individuals to meet their goals. They engage in other problematic behaviors to avoid the anxiety provoking behaviors. Addiction (Self-medication) is an example. People drink alcohol to cope with their stress. Fouquereau, Fernandez, Mullet, and Sorum (2003) showed that alcoholics had significantly greater urges to drink after reading about stressful scenarios than did non-alcoholics. Dissociation is also prevalent among people who go through or have gone through trauma. This is especially true when a person cannot escape the traumatic event (Freyd, 1996).

Dynamic therapies, like most descendants of psychoanalysis, would view rumination as a defense that may be the result of past unresolved conflicts. The rest of the above mentioned behavioral problems would be explained as defenses employed by individuals to protect themselves from certain outcomes (Corsini & Wedding 2008). Dynamic therapists would work on helping these individuals gain insight into their own behaviors. Cognitive behavior therapists, on the other hand, would work on helping such individuals alter their maladaptive emotions and behaviors through desensitization to help them think more "rationally" (Lambert, Berg, & Garfield, 2004). Behavioral problems seem to reciprocally interact with the behavioral developmental stage and valuation of outcome of a behavior of an individual. Although the outcome of most therapies result in a raise in stage, neither Dynamic therapies nor CBT overtly work towards altering an individual's behavioral developmental stage and valuation of outcome of a behavior. DBAT successfully addresses these two variables. How behavioral problems affect stage and value will be discussed in the following section.

How behavioral problems affect stage and value

The above behaviors of individuals with behavioral problems tend to affect stage and value. Behavioral problems either freeze or decrease the behavioral developmental stage at which individuals function. For example, avoidant behavior hinders individuals from progressing on to the next stage of development. When individuals do not confront conflicts about trauma and loss, they do not give themselves a chance to process the event and evaluate it from the perspective of a higher behavioral developmental stage. Likewise,

rumination also freezes the behavioral developmental stage of a person. Researchers in information processing have theorized that one of the factors limiting working memory is conflict in information processing. Pascual-Leone (2004) established that working memory is constricted when individuals are dealing with a misleading situation (situation that hinders individuals from the task at hand). Dealing with such situations requires them to interrupt *misleading schemes* (schemes that hinders task at hand). Interrupting misleading schemes also interrupts *task-activated schemes* (schemes required to solve the task). Consequently, task-activated schemes will have to be activated by using more space in the working memory to solve the task at hand. It can be inferred that rumination is an example of a misleading situation. Individuals who ruminate are not able to successfully activate task-activated schemes. This may freeze one's behavioral developmental stage. Horowitz (2001) came up with a similar theory on rumination and information processing. In explaining his *Completion Principle* on stress response syndromes, he stated that when individuals do not successfully process their stressful events or problems, the unprocessed problems occupy their working memory which leads to rumination and repetitive evocation of emotions such as guilt, fear, anger and anxiety until the information is completely processed. Thus, we infer that since rumination hinders information processing and affects cognitive development, it also freezes behavioral developmental stage. Similarly, the value of behavior reinforcement or punishment is also affected by behavioral problems. In most cases, individuals with such problems do not assess the cost of a problem behavior. For example, people may have "negative delusions" by not seeing, denying or even not understanding the cost of their problem behaviors. In some cases individuals may be employing what Freud (1968) would call *minimization* because they know that a behavior is problematic, but they deny the severity of the consequences of those behaviors. In other cases, individuals simply *deny* the negative consequences of their problem behavior altogether. In J's case, he knew that his inactivity was problematic, but he did not realize the severity of the consequences of his inactivity. He did not understand that the cost of his inactivity was that he would not get admission to a graduate school. He thought that being involved in research was enough to get into graduate school. He denied the need to do all the other preparations to get into graduate school. Such people also tend to discount the value of desirable behaviors as they tend to overestimate the risks of such behaviors. J overestimated the risk of preparing for GRE and looking for mentors with whom his interests matched. The risk for J in this case was the immediate displeasure and stress associated with those activities.

» J'S BEHAVIORAL DEVELOPMENTAL STAGE AND VALUE

The preceding sections established the importance of stage and value in changing problematic behaviors and how behavioral problems affect stage and value. This section presents how a DBA would perceive J's problem behavior in terms of his behavioral developmental stage and his valuation of reinforcement of engaging in behaviors that would help him get into a graduate school. The DBA would identify J's problem behaviors and the lack of behaviors, such as, his unawareness of what would help him be a strong candidate for a doctorate program. Another variety of therapists might inquire whether a Ph.D. program and being a strong candidate were of interest to J. If the answer is no, this would be a very different approach from DBAT. DBAT would posit that his answer in the negative may be due to J's lack of understanding of how the world works, not because he was not interested in graduate school. However, if J did agree that going to graduate school was of interest to him, his lack of understanding included the need to study for the GRE, giving presentations at conferences and having publications. J thought that being bureaucratic by having good grades, some minor research experience, and filling out the forms would be enough to get him into graduate school. He was not aware that he had to understand the structure of the organization. He did not understand that there had to be a good correspondence between prospective advisors and himself. He did not read about prospective advisors and their research. He made no effort to correspond with them. He did not understand that advisors are looking for students who could advance their research. In addition, he did not understand established procedures to make his graduate school application stronger. He did not understand that getting exceptional GRE scores and having research success would increase the chances of an advisor picking him. He did not know how to study for the GREs. He did not understand the probabilistic nature of admissions and that he needed to apply to at least 12 graduate schools of varying competiveness. He did not understand that he needed to write his biography (statement of purpose) as a motivated individual showing how his interest and successful actions developed without engaging in self-evaluation. He had to get strong letters of recommendation. However, he was not aware that he needed to supply his recommenders with not only a list of schools, but also his curriculum vitae and statement of purpose. To understand this entire process, he had to perform at a systematic stage (Commons, Miller, Goodheart, & Danaher-Gilpin, 2005). However, he did not understand these issues as he was performing at a formal stage. Thus, the DBA would aim to help J move up a stage to help him understand what would help J become a strong candidate for a Ph.D. program.

Raising stage, by itself, is not sufficient to alter J's behavior. The DBA would work on changing his valuing and discounting as well. First, J discounted the positive value of the consequences he would obtain from preparing for Graduate Record Exam (GRE) or getting his work published. This was because the reinforcement would not be an immediate one. He would not get into a graduate school as soon as he was done with his GRE or getting published. Without immediate outcomes, such as, checking off items in a to-do-list, he refrained from engaging in those behaviors. Second, his perceived risk of engaging in those activities was too high. He perceived the discomfort he would get from engaging in those activities to be very great. This led to his avoidance of those behaviors. Third, he did not understand the cost of not engaging in those behaviors. He did not comprehend that avoiding those behaviors would hinder him from getting into a graduate school. Thus, in addition to raising J's stage of performance, the DBA would also work on increasing J's tolerating the delays of reinforcement, decreasing perceived risk of the desired behavior and correctly estimating

the cost of his problematic behavior. The procedures involved in raising stage and altering value are laid out in the second part of this paper. The procedures are divided into alliance building, presteps in intervention and intervention. Presteps in intervention include identifying problem behaviors, recognizing stage of problem behavior, assessing how delay discounting and perceived risks affect the problem behavior, setting target behavior, targeting small behavioral change to win the advisee's trust and identifying necessary skills or subtasks to overcome the problem behavior. Intervention includes setting boundaries, setting contingencies, helping the advisee recognize the cost of problem behavior, measuring sensitivity to reinforcement by measuring preference and using it to reinforce the target behavior, increasing the rate of responding in one area to increase rate of action in another and other supplemental therapies/training.

» DISCUSSION

DBAT is the first behavioral analytical therapy that incorporates behavioral developmental stage and value of outcome of a behavior into its working. It is quite different from conventional therapies as it focuses on altering problem behaviors directly to help individuals live satisfying lives despite their existing behavioral problems. It could be a good adjunct to contemporary therapies as it approaches behavioral problems by aiming to raise one's behavioral developmental stage and alter their value of outcome of a behavior. There is evidence that behavioral developmental stage affects an individual's behavior (Kurtines & Gewirtz, 1984; Lickona, 1976). Moreover, behavioral developmental stage also seems to affect the kind of defense mechanism one uses, in the psychoanalytic sense, which in turn affects one's behavior (Semrad, 1969a, b, c). Hence, developmentally based behavior therapy, such as DBAT, could be a very useful adjunct to the existing therapies.

Professionals to whom this therapy could be particularly useful are psychologists, clinical social workers, psychiatrists, and psychoanalysts who work with college and graduate students. This therapy would particularly work on high functioning individuals who have a potential for a raise in stage.

Although DBAT is a new kind of therapy that may be beneficial to many individuals, there might be doubts about how different it actually is from already existing interventions, its use and effectiveness. We recommend that DBAT be used in conjunction with other existing interventions such as CBT, DBT and ACT.

Superficially, DBAT may resemble coaching to the extent that both involve the proffering of advice. However, DBAT can be distinguished from coaching in the respect DBAT has specific theoretical bases. Moreover, DBAT also addresses behavioral problems. Coaching does not address behavioral problems.

A possible critique of this therapy would be that it does not directly address maladaptive emotional behavior and only focuses on changing operant behaviors. Whereas, CBT addresses maladaptive emotional behavior separately, DBAT indirectly addresses such emotional behavior. DBAT gets the person to engage in an operant behavior that exposes them to positive reinforcement that competes with the maladaptive emotions. For example, proponents of DBAT helping J study for GRE, get publications, apply to graduate school and get admitted to one, the maladaptive emotions related to being stuck will subside. Also, it alters the problem behaviors that trigger the maladaptive emotions.

DBAT is also different from dynamic therapies because it works on improving individuals' social perspective taking skills (Insight into others' perspectives). Dynamic therapy on the other hand works on helping individuals gain insight into their own conflicts. Additionally, DBAT focuses on the individual's present and does not delve into the past. Dynamic therapies help individuals understand their conflicts rather than overcome their problem behaviors associated with perspective taking. However, DBAT tries to do so by helping individuals perform at a higher behavioral developmental stage and altering their values and their discounts regarding the outcome of behaviors that compete with those problem behaviors.

Another possible critique may question the usefulness of DBAT in that it does not cure the mental illness itself, but rather only works towards managing and ameliorating "symptoms". It is true that DBAT only targets certain problematic behaviors and is suggested as an adjunct to existing therapies instead of a replacement as mentioned above.

One question regarding the effectiveness of DBAT could be as to how individuals continue to behave in desirable ways following termination of therapy. This would be a valid concern because this therapy is highly instructional and requires the DBA to provide explicit advice and supervision to the individual during the course of therapy. The question arises of dependency on the DBA for the continuation of desirable behavior since the analyst provides close guidance to the individual to overcome the problem behavior. Although this is a valid concern, DBAT works towards making an individual achieve desired behaviors ultimately with the aid of real world contingencies, rather than self-induced ones. This ensures the continuation of desired behavior as the behavior becomes dependent on real world contingencies and not the contingencies set by the DBA. The acknowledgement of the importance of real world contingencies in maintaining a desired behavior is an advantage DBAT has over other behavioral analytic therapies. Contemporary behavioral analytic therapies do not place an emphasis on real world contingencies to maintain a desired behavior which is why they often do not have high success rates. For example, most weight loss programs have failed as individuals do not continue to engage in desired behaviors once they are out of the program. A meta-analysis of US studies in long-term weight-loss maintenance showed that in five years, subjects who underwent structured weight-loss programs were able to maintain weight loss of only 3% less than their initial weights (Anderson, Konz, Frederich, and Wood, 2001). The procedures regarding setting contingencies are discussed and explained in greater detail in the second part of this paper.

This paper introduced DBAT, discussed the theoretical underpinnings of the therapy and made a case for the importance of a behavioral therapy utilizing a developmental behavioral perspective. We direct the audience to the sequel of this paper for more information on the application of this therapy. It discusses how this therapy initially emerged, lays out the sequence of procedures of this therapy and presents case studies of six individuals who underwent the therapy and had relative success in altering their problem behaviors. ■

REFERENCES

Anderson, J.W., Konz, E.C., Frederich, R.C. & Wood, C.L. (2001). Long-term weight-loss maintenance: a meta-analysis of US studies. *The American Journal of Clinical Nutrition*, *74*, 579–584.

Armon, C. (1985). Ideals of the good life: Their role in career education, *California Career Education Journal*, *2*(1).

Armon, C. (1993). The nature of good work: A longitudinal study. In J. Demick & P.M. Miller (Eds.), *Development in the workplace* (pp. 21–38). Hillsdale, NJ: Erlbaum.

Armon, C., & Dawson, T.L. (1997). Developmental trajectories in moral reasoning across the lifespan. *Journal of Moral Education*, *26*(4), 433–453.

Atlas, G.D., & Them, M.A. (2008). Narcissism and sensitivity to criticism: A preliminary investigation. *Current Psychology: A Journal for Diverse Perspectives On Diverse Psychological Issues*, *27*(1), 62–76. DOI:10.1007/S12144–008–9023–0.

Basseches, M., & Mascolo, M.F. (2010). *Psychotherapy as a developmental process*. New York, NY US: Routledge/Taylor & Francis Group.

Bernholt, S., Parchmann, L., & Commons, M.L. (2009). Kompetenzmodellierung zwischen Forschung und Unterrichtspraxis. *Zeitschrift fur Didaktik der Naturwissenschaften*, *15*, 217–243.

Binder, C. (2000). *Component/composite analysis and programming from the "real world."* Paper presented at the Association for Behavior Analysis, Washington, DC.

Campbell, D.P. (1974). *Manual for the Strong-Campbell Interest Inventory*. Stanford University Press: Stanford, CA.

Coffey, S.F., Schumacher, J.A., Baschnagel, J.S., Hawk, L.W., & Holloman, G. (2011). Impulsivity and risk-taking in borderline personality disorder with and without substance use disorders. *Personality Disorders: Theory, Research, and Treatment*, *2*(2), 128–141. DOI:10.1037/A0020574.

Commons, M.L. (2001). A short history of the society for quantitative analyses of behavior. *The Behavior Analyst Today*. *2*(3). 275–279.

Commons, M.L. (2006). Measuring an Approximate *g* in Animals and People. *Integral Review*, *3*, 82–99.

Commons, M.L., Gane-McCalla, R., Barker C.D., Li, E.Y. (in press). The Model of Hierarchical Complexity as a measurement system. *Journal of Adult Development*.

Commons, M.L., Barry-Heffernan, T. (2012, July). *A model of stage and value to predict behavior*. The Society for Mathematical Psychology, Columbus, OH.

Commons, M.L., Barry-Heffernan, T., Gane-McCalla R.F., Commons-Miller, N.H.K., Miller, L.S., Pekker, A., Giri, S., Richardson, A.M. & Woodford, M. (2013). Understanding Value and Time in Static and Changing Schedules of Reinforcement. Manuscript submitted for publication.

Commons, M.L., Goodheart, E.A., Pekker, A., Dawson, T.L., Draney, K., & Adams, K.M. (2008). Understanding Rasch measurement: Using Rasch scaled stage scores to validate orders of hierarchical complexity of balance beam task sequences. *Journal of Applied Measurement*, *9*(2), 182–99.

Commons, M.L., Grotzer, T.A. & Davidson, M.N. (in press). The sufficiency of reinforcing problem solutions for transition to formal operations. *Behavior Development Bulletin*.

Commons, M.L., Li, E.Y., Richardson, A.M., Gane-McCalla, R., Barker, C.D., Tuladhar, C.T. (in press). Does the Model of Hierarchical Complexity produce significant gaps between orders and are the orders equally spaced? *Journal of Applied Measurement*.

Commons, M.L., Miller, P.M., Goodheart, E.A., & Danaher-Gilpin, D. (2005). *Hierarchical Complexity Scoring System: How to Score Anything*. Retrieved from http://dareassociation.org/papers/scoring%20manual.htm

Commons, M.L., & Pekker, A. (2008). Presenting the formal theory of hierarchical complexity. *World Futures: Journal of General Evolution*, *65*(1–3), 375–382.

Commons, M.L., & Richards, F.A. (2002). Organizing components into combinations: How stage transition works. Journal of Adult Development, 9(3), 159–177.

Commons, M., & Richards, F.A. (2003). Four Postformal Stages. In J. Demick, C. Andreoletti (Eds.), *Handbook of adult development* (pp. 199–219). New York, NY US: Kluwer Academic/Plenum Publishers. DOI:10.1007/978–1–4615–0617–1_11

Commons, M.L., & Rodriguez, J.A. (1990). "Equal Access" without "establishing" Religion: The necessity for assessing social perspective-taking skills and institutional atmosphere. *Developmental Review*, *10*, 323–340.

Commons, M.L., & Rodriguez, J.A. (1993). The development of hierarchically complex equivalence classes. *Psychological Record*, *43*, 667–697.

Commons, M.L., Rodriguez, J.A., Adams, K.M., Goodheart, E.A., Gutheil, T.G., Cyr, E.D. (2006). Informed consent: Do you know it when you see it? Evaluating the adequacy of patient consent and the value of a lawsuit. *Psychiatric Annals*, *36*, 430–435.

Commons, M.L., Ross, S.N., & Bresette, L.M. (2011) The connection among postformal thought, stage transition, persistence, and ambition and major scientific innovations. In C. Hoare (Ed.). *Oxford handbook of adult development and learning*. (pp 287–301). New York: Oxford, 2nd edition.

Commons, M.L., Trudeau, E.J., Stein, S.A., Richards, F.A., & Krause, S.R. (1998). The existence of developmental stages as shown by the hierarchical complexity of tasks. *Developmental Review*, *8*(3), 237–278.

Commons, M.L., & Wolfsont, C. (2002). Empathy: Its ultimate and proximate bases does not consider developmental changes A commentary on Stephanie D. Preston and Frans B.M. de Waal target article, *Behavioral and Brain Sciences*, *25*(1), 30–31.

Commons-Miller, L.A.H., Commons, M.L., Li, E.Y., Miller, P.M., Golino, H. & Tuladhar, C.T. (2012). Stage of Pricing Strategy Predicts Earnings: A Study of Informal Economics. Manuscript submitted for publication.

Corsini, R.J., & Wedding, D. (2008). *Current Psychotherapies*, *8th Edition*. Belmont, CA: Thomson Brooks/Cole.

Dawson, T.L. (2000). Moral reasoning and evaluative reasoning about the good life. *Journal of Applied Measurement*, *1* (372–397).

Dawson, T.L. (2003). A stage is a stage is a stage: A direct comparison of two scoring systems. *Journal of Genetic Psychology*, *164*, 335–364.

Dawson, T.L. (2002). A comparison of three developmental stage scoring systems. *Journal of Applied Measurement*, *3*, 146–189.

Dawson-Tunik, T.L. (2004). "A good education is. . ." The development of evaluative thought across the life-span. *Genetic, Social, and General Psychology Monographs*, *130*, 4–112.

Ehlers, A., & Clark, D.M. (2000). A cognitive model of posttraumatic stress disorder. *Behavior Research and Therapy*, *38*, 319–345

Farmer & Chapman, (2007). *Behavioral interventions in cognitive behavior therapy: Practical guidance for putting theory into action*. Washington, DC: American Psychological Association

Fouquereau, E., Fernandez, A., Mullet, E., & Sorum, P. (2003). Stress and the urge to drink. *Addictive Behaviors*, *28*(4), 669–685. DOI:10.1016/S0306–4603(01)00276–3

Freud, A. (1968). *The Ego and the Mechanisms of Defence*. London, UK: Hogarth Press Ltd.

Freyd, J.J. (1996). *Betrayal trauma: The logic of forgetting childhood abuse*. Cambridge, MA US: Harvard University Press.

Head, L. S., & Gross, A. M. (2009). Systematic desensitization. In W. T. O'Donohue, J. E. Fisher (Eds.), *General principles and empirically supported techniques of cognitive behavior therapy* (pp. 640–647). Hoboken, NJ US: John Wiley & Sons Inc.

Horowitz, M. J. (2001). Explanation of symptom formation. In M. J. Horowitz, *Stress response syndromes: Personality styles and interventions* (pp. 111–140). Nathvale, NJ: Jason Aronson Inc.

Kegan, R. (1982). *The evolving self: Problem and process in human development*. Cambridge, MA: Harvard University Press.

Kitchener, K. S., & Fischer, K. W. (1990). A skill approach to the development of reflective thinking. *Contributions to Human Development*, *21*, 48–62.

Kitchener, K. S., & King, P. M. (1990). The reflective judgment model: ten years of research. In M. L. Commons, C. Armon, L. Kohlberg, F. A. Richards, T. A. Grotzer & J. D. Sinnott (Eds.), *Adult development* (Vol. 2, pp. 62–78). New York: Praeger.

Kurtines, W. M. & Gewirtz, J. L. (Eds.). (1984). *Morality, moral behavior, and moral development*. New York, NY: John Wiley and Sons, Inc.

Lambert M. J., Bergin A. E., Garfield S. L. (2004). Introduction and historical overview. In M. J. Lambert, *Bergin and Garfield's Handbook of Psychotherapy and Behavior Change* (pp. 3–15). New York: John Wiley & Sons.

Lickona, T. (Ed.). (1976). *Moral, development and behavior*. United States of America: Holt, Rinehart and Winston.

Linehan, M. M. (1987). Dialectical Behavior Therapy for borderline personality disorder: Theory and method. *Bulletin of The Menninger Clinic*, *51* (3), 261–276

Mystkowski, J. L., & Mineka, S. (2007). Behavior therapy for specific fears and phobias: Context specificity of fear extinction. In T. A. Treat, R. R. Bootzin, T. B. Baker (Eds.), *Psychological clinical science: Papers in honor of Richard M. McFall* (pp. 197–222). New York, NY US: Psychology Press.

Pascual-Leone, J., & Johnson, J. (2004). Affect, self-motivation, and cognitive development: A dialectical constructivist view. In D. Dai, R. J. Sternberg (Eds.), *Motivation, emotion, and cognition: Integrative perspectives on intellectual functioning and development* (pp. 197–235). Mahwah, NJ US: Lawrence Erlbaum Associates Publishers

Semrad, E. V. (1969a). Teaching the clinical approach. In D. Van Buskirk (Ed.), *Teaching Psychotherapy of Psychotic Patients: Supervision of Beginning Residents in the "Clinical Approach"* (pp. 4–16). New York: Grune & Stratton.

Semrad, E. V. (1969b). A clinical formulation of the psychoses. In D. Van Buskirk (Ed.), *Teaching Psychotherapy of Psychotic Patients: Supervision of Beginning Residents in the "Clinical Approach"* (pp. 17–30). New York: Grune & Stratton.

Semrad, E. V. (1969c). Comments on psychotherapy of the psychoses. In D. Van Buskirk (Ed.), *Teaching Psychotherapy of Psychotic Patients: Supervision of Beginning Residents in the "Clinical Approach"* (pp. 31–44). New York: Grune & Stratton.

Sonnert, G., & Commons, M. L. (1994). Society and the highest stages of moral development. *The Individual and Society*, *4* (1), 31–55.

Springer, J. M. (2012). Acceptance and Commitment Therapy: Part of the "Third Wave" in the Behavioral Tradition. *Journal Of Mental Health Counseling*, *34* (3), 205–212.

Strong, E. K. (1943). *Vocational interests of men and women*. Stanford University Press: Stanford, CA

Wahl, K., Ertle, A., Bohne, A., Zurowski, B., & Kordon, A. (2011). Relations between a ruminative thinking style and obsessive-compulsive symptoms in non-clinical samples. *Anxiety, Stress & Coping: An International Journal*, *24* (2), 217–225. DOI:10.1080/10615806.2010.482985

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Developmental behavior analytic therapy: Procedures and case studies

Michael Lamport Commons[1] and Charu Tara Tuladhar[2]

1 Department of Psychiatry, Beth Israel Deaconess Medical Center, Harvard Medical School
2 Dare Institute

ABSTRACT

This paper discusses the case studies applying Developmental Behavioral Analytic Therapy (DBAT), a new behavioral therapy with developmental underpinnings. It also lays out the sequence of procedures of this therapy. The procedures have been illustrated with examples from six case studies of individuals who have undergone the therapy. It also presents the methodology and results of intervention using DBAT on those six individuals. With DBAT, five out of the six individuals achieved their target behaviors and increased their developmental stages. The positive results yielded from this small sample suggest potential benefit and success of DBAT therapy.

KEYWORDS: behavioral development, therapy, individualization of behavioral requirements within task sequence, reinforcement, action, behavioral disorders, value of consequences and its discounts, model of hierarchical complexity

The first part of this paper (Commons & Tuladhar, 2014) introduced the Developmental Behavior Analytic Therapy (DBAT) and discussed the theoretical underpinnings of the therapy. The current paper is a sequel of the first paper and presents the applications of the therapy. First, it discusses the history of the therapy. Second, it lays out the sequence of procedures using illustrations from examples of six case studies of individuals who had undergone this therapy. Finally, it presents the methodology and results of interventions using DBAT on those six individuals. The six case studies are presented in full in Appendix A for reference.

The development of DBAT

The idea of DBAT began to develop in 1962 from the observations of child behavior at the Dubnoff Center for Educational Therapy while working with the children there. The diagnoses of these children included autism, brain injury, and schizophrenia. Many of these children had difficulties in their school work. Some of them were unable to talk. They displayed aggressive and seemingly un-cued behaviors, such as, shouting-out incomprehensible words and phrases. What seemed to work well in helping the children engage in desirable behaviors was instituting positive reinforcement contingencies for those desirable behaviors, and contingencies for behaviors that interfered with the non-work behavior. For example, food was used as a positive reinforcer for desirable behaviors. To help some of the children overcome distraction and wandering, remaining seated was reinforced with a positive reinforcer. Later on, positive reinforcers were observed to work better when the children had the opportunity to choose their own reinforcers (M. L. Commons, Personal communication, 1962). This insured that the reinforcers were valuable to that particular individual, simplifying the consent process.

Later on this approach was observed to work well with adults as well (M. L. Commons, Personal communication, 1962). The problems of those adults were less severe than those of the children at the Dubnoff Center. In 1970, at the behest of Lovaas, the Dare School for Autistic children was founded in Brooklyn, New York. The success rate at Dare for mainstreaming its students into regular school was 20%. This rate is among the highest in the field, even today. In working with children with autism, it was discovered that this was due to the failure to know what developmental sequences were important to change behaviors for those children. One of the more important challenges that were addressed was, where in a developmental sequence of tasks do the behaviors of the child with autism fell. Another challenge was determining what sequences were crucial to facilitate the development of that individual child.

We observed that the target behavior required an individual to acquire a behavior that was one developmental behavioral stage higher than the stage at which they initially functioned. The increase in stage could not be two or higher (M. L. Commons, Personal communication, 1962). The need to know the developmental sequences is not an accepted finding. The field of applied behavior

Correspondence regarding this article should be addressed to Michael Lamport Commons, Ph.D., Harvard Medical School, 234 Huron Avenue, Cambridge, MA 02138, commons@tiac.net, (617) 497-5270.

The authors would like to thank Dr. Sharon McNamara and Dr. Richard Goldberg for reviewing this article. They would also like to thank Mr. William Joseph Harrigan and Mr. Sagun Giri for their help with copy editing the article.

analysis is split into two groups: one that sees development as being sequential with later behaviors dependent on the acquisition of earlier behaviors (Binder, 2000; Ruiz-Rosales, 2000). The other group does not see long developmental sequences (Rosales-Ruiz & Baer, 1997; Skinner, Vaughan, 1983). They only see sequences that are two behaviors long.

Taking the former approach, it was found that the target behavior had to be an attainable one, and that it was the next step in the developmental sequence. Trying to instate behavior too far removed led to aping responses in children with autism at the Dare school. For example, the children learned to imitate words in an "as if" fashion, but did not use those words to communicate, because using those words in their speech was a quantum leap in their developmental sequence. To determine whether a target behavior was attainable or not, it required scoring problem behaviors and determining the stages of performance of the behaviors in the task sequence.

DBAT was developed to extend these observations. This approach was successful in altering behaviors of individuals who would be classified as having obsessive compulsive disorder (OCD), depression, and borderline personality disorder (BPD).

» THE THERAPY

DBAT is a task oriented therapy that involves altering one's behaviors by helping an individual raise their developmental behavioral stages of action, and alter their outcomes for specific behaviors. Superficially, DBAT resembles coaching, in that both involve proffering advice. Hence, the individuals whose behaviors are altered are referred to as the *advisee* as opposed to the client or patient. This highly instruction-based therapy requires the *Developmental Behavior Analyst (DBA)* to provide direct supervision to the advisee. *Problem behaviors* are identified by both the DBA and the advisee in most cases. In some cases, only the DBA identifies such problematic behaviors, while the advisee may disagree. However, if the advisee wants to be left alone, the DBA respects the advisee's wish.

The core principles of this therapy require the DBA to:

1. Form a strong alliance with the advisee
2. Intervene in a work or home setting
3. Set boundaries
4. Allow DBA induced and real world contingencies to work on attaining the target behavior
5. Raise developmental stage at which the advisee behaves
6. Change value of outcome behavior
7. Combine DBAT with other therapies/interventions known to work well for the specific problem the advisee may be suffering from.

The advisee

We define advisees as individuals who need help in altering their behaviors in order to lead a more satisfying life. DBAT aims to increase the rate of adaptive behaviors in individuals with behavioral problems. We have observed that in most cases advisees recognize their problem behaviors. Although they recognize a behavior as problematic, they may deny the seriousness of their problem by misjudging the cost of such behaviors (Commons & Tuladhar, 2014). Example of this is discussed in later sections of this paper. In some cases, the advisees are in complete denial about problematic behaviors. Such individuals may require additional assistance by the DBA to overcome denial.

The DBA

The DBA provides supervision to advisees in their natural environment. An important characteristic of DBAT is that it requires the DBA to be highly instructive and task oriented. DBAs do not aim to alter the "motives" of their advisees. They aim to alter their behaviors, such that their behaviors become more adaptive. The DBA and the advisee jointly determine which behaviors are adaptive and which behaviors are not. One of the ways in which the DBA helps the advisee to overcome a problem behavior is by raising the developmental stage of the advisee. This is done by providing models that help the advisee reach the next-stage behavior (Fischer, Hand & Russell, 1984). DBAs also alter the values of outcome behaviors of the advisee. Unlike conventional clinicians, DBAs contract for sharing the responsibility of altering the target behaviors with advisees.

Therapy setting

Unlike most conventional therapies, the DBA "intervenes" in the advisees' natural environment such as their homes, work and schools. This conflicts with the traditions of office-based therapy. The reasons are straight forward. Behavior occurs in the specific contextual background. Advisees quickly come to discern which situations the contingencies that alter a behavior will hold. The contingencies may hold in the office, but not in other settings. Hence, if the therapy is done in the different settings of the advisee, it is possible that the improvement can be generalized. But one cannot assume that simply because therapy is helpful in the office setting that it will also be helpful in other settings without clinical evidence. This position is supported by the shift of early childhood intervention therapists and educators into family centered practices (Thompson, 2012). Moreover, Dunst, Hamby, Trivette, Raab, & Bruder (2000) also hold that intervention in children should be done in natural settings as most of the learning takes place in natural environments, such as home and child care facilities. A partial example of a therapy that adopts similar therapeutic settings would be Linehan's (1987) work in which she insists that therapists be available by phone to intervene in vivo for clients who are cutting or self-injuring.

Primary goal

The primary goal of this therapy is not to alter the biological susceptibility of advisees to behavioral problems, but to help them change behaviors in ways that help them lead more satisfying lives as defined jointly by the DBA in collaboration with the advisee. This therapy does not aim to replace any existing therapies, but rather complements existing ones (Commons & Tuladhar, 2014).

Procedure

The procedures of DBAT are categorized into three broad steps:

a) Building an alliance
b) Presteps in intervention
c) Intervention

Building an alliance. From a behavioral perspective, a therapeutic alliance is a form of cooperation between the advisees and the DBA. This dyad undertakes improving behaviors together, while at the same time maintaining boundaries about who is doing what. The first step, as in conventional therapies, is to establish an alliance. The alliance is achieved in the following manner:

1. The DBA asks advisees to describe their feelings and sufferings.
2. The DBA makes the advisee feel that the DBA cares about the advisee. This can be done by checking in on the advisee every day and respectfully inquiring about how the advisee is doing.
3. The advisee begins to feel that the DBA understands the advisee. This is accomplished by integrating the advisee's wants into the treatment.

Cases illustrating alliance building. Case 1 illustrates how the DBA facilitated the alliance. D was a 72 year old man who suffered from dependent personality disorder and OCD with hoarding behaviors. His partner had received a diagnosis of borderline personality disorder. They had a difficult relationship in which she pushed him around and constantly yelled and screamed at him, making hysterical demands. He tried to comply with her impossible demands, although his effort was vilified. The DBA started by asking him how he was feeling. He asked him about his marital problem. This helped the DBA gain D's perspective and establish a therapeutic alliance. This was something that neither D's partner nor anyone in his family had ever accomplished. The DBA conversed with him daily and inquired about how he was doing. The DBA listened to what D had to say and kept track of where he was, and what he was doing. This assured D that the DBA wanted to help him, thus establishing a therapeutic alliance.

Case 2 illustrates how a DBA can help the advisee feel heard and understood. "A" was a 9 year old girl, who was diagnosed with oppositional-defiant disorder. Her behavior was very problematic as she threw fits by throwing things around and attacking other people. She had authoritarian, punitive parents who got extremely angry when she protested or had a fit. The DBA started building an alliance with her by asking her how she would like to spend the day. He listened to her and planned her day according to what she wanted to do. Whereas A's parents did not listen to her, the DBA made her feel that her struggles were important. Unlike her parents, the DBA was non-confrontational and nonjudgmental. He respected her consent and involved her in establishing rules for herself.

Presteps in intervention. Below are the presteps taken after building an alliance.

1. Identify problem behaviors

Problem behaviors are behaviors that hinder advisees from reaching their objectives. For example, in the case of "D," one of the problem behaviors was that he hoarded goods such as old cars, wood, garbage cans, etc. In case of "A," she threw fits and hurt other people. The problem behavior is identified by the DBA alone, if the advisee lacks the requisite capacities necessary to be considered competent. It is possible to score the stage of that understanding of behavior using the Model of Hierarchical Complexity Scoring Scheme. If the stage of performance is below the order of complexity required for understanding, then the person should be presumed incompetent with respect to that particular task. Under those circumstances, the DBA establishes a substitutive judgment in the interests of the advisee. In contrast, if the advisee is presumed competent, the DBA and the advisee together identify the problem behavior. In such cases, the DBA obtains informed consent from the advisee regarding what problem behavior to work on. If on the other hand the advisee cannot be presumed competent to point out the problem behavior, as in the case of "A," the DBA designated the problem behavior on the advisee's behalf.

2. Recognize stage of problem behavior

Recognizing stage of problem behavior is important as the target behavior is established based on the stage of the problem behavior. This is done using the Hierarchical Complexity Scoring System (HCSS) (Commons, Miller, Goodheart & Danaher-Gilpin, 2005). For example, in the case of "C," he did not represent himself and submitted to his wife's unreasonable demands to "maintain harmony" in the family. This was scored as an abstract stage behavior. In the abstract stage, one understands and conforms to social norms of the group to which one belongs. For a behavior to be abstract in stage, it has to coordinate two or more concrete stage tasks. In this case, at least two concrete stage deals contributed to C's abstract stage behavior of following the social norm of harmony. First, he thought that his marriage would end if he did not submit to his wife's demands. Second, he thought that if he did not submit to his wife's demands and ended up having a divorce, she would appeal for sole custody of their daughter which she might win. The loss of his daughter was a very high price to pay. These two concrete stage deals coordinated to give rise to C's behavior of submitting to his wife's unreasonable demands.

3. Assess how delay, discounting, and perceived risks affect the problem behavior

Both delay discounting and perceived risks contribute in the maintenance of a specific problem behavior. Avoidance of a target behavior results from high perceived risk and/or long delayed positive outcome, and conversely engagement in the problem behavior results from short delay and/or low perceived risk. Delay discounting decreases the likelihood of the adaptive behavior occurring, and failed discounting increases the likelihood of a non-adaptive behavior occurring (Ainslie, 2008; Commons, Woodford & Duchney, 1982; Logue, 1988; Mazur, 1987; Rachlin, 2006).

Cases 1 and 3 illustrate how delay discounting and perceived risks are dynamics that reinforce problem behaviors. In the case 1, one of D's problem behaviors was that he was a hoarder. His hoarding made his neighbors uncomfortable and exposed him to risks regarding hygiene. However, he did not see these consequences and was in denial regarding the risks of his problem behaviors. The negative reinforcer was the anticipation of loss regarding future use of the hoarded object. Typically this is described as anxiety, but the behavioral developmental view describes the contingencies themselves rather than the effect of those contingencies. The positive reinforcement was his belief that he would not be able to use the hoarded object in the future. Although he would receive

the positive reinforcement for the hoarded goods, the value of that reinforcer did not decrease which led to the reinforcement of his behavior. In this situation, failed discounting of the use of hoarded goods and low perceived risk of hoarding those goods combined to maintain the hoarding behavior.

On the other hand, in case 3, "F" avoided a target behavior due to discounting and high perceived risk. F was a very smart 22 year old attending *Harvard Extension School of Harvard University*. However, he was struggling to form good study habits as he experienced problems with concentration, planning, work attack and completion. As a result his grades suffered. This hindered him from working towards his future goal of being admitted to the degree program in *Harvard Extension School* to complete college and attend graduate school. He had no understanding about how to work on improving his grades. One of his problems was that he avoided taking classes that required him to write papers for classes, because he said he was afraid of criticism of his work. This was true despite the fact that he hoped to become a fiction writer. He did not value the fact that taking those classes would help him move forward in getting a college degree in the future, as much as he valued the immediate negative reinforcement that he obtained from avoiding those classes. Consequently, he discounted the value of taking those classes. In addition, his perceived risk of taking those classes was too high due to fear of being criticized. In this way, discounting the value of taking those classes and having a very high perceived risk interplayed in maintaining and reinforcing his behavior of avoidance.

4. Set target behavior

Target behaviors are behaviors that the DBA and the advisees aim to achieve. They are behaviors that help advisees reach their objectives. A target behavior should require the advisee to perform at a stage higher than the problem behavior. For example, in case 4, C was a 50 year old radiological physicist who obtained his Ph.D. from a prestigious university. Before the intervention, he was working as a supervisor. One of his problems was that he was on the verge of being let go from his work because of poor performance. He did not communicate well with his supervisees nor monitor them. His shyness and anxiety interfered. He seemed unable to be a leader without realizing that he lacked the skills to be a supervisor. This was identified as the problem behavior and scored to be a formal stage behavior. The target behavior was to recognize which job might suit his skills better. This required him to perform at a systematic stage. Systematic stage is a stage higher than formal stage. Thus, the target behavior required "C" to perform at a stage higher than the stage at which he had customarily performed.

5. Target small behavioral change to win the advisee's trust

The small behavioral change has to require the advisee to perform at the same stage as that of the problem behavior. This ensures the success of the small behavioral change, as it does not require the advisee to function at a higher stage than their current stage. With the success of a small behavioral change, the DBA can build trust and strengthen the therapeutic alliance.

Case 3 illustrates how this is done. "F" struggled to form good study habits and attain good grades. However, the DBA did not start by aiming to help F form good study habits and improving his grades. Initially, he targeted a small behavioral change. He took F to a grant proposal workshop. F did not think he could complete the workshop. However, the DBA helped him overcome this fear. The DBA frequently contacted him to gauge his success. The DBA reviewed his work. In the end, F was able to complete the workshop. On completing the workshop, F's trust of the DBA increased. This trust helped F build a stronger alliance with the DBA. This is an example of how the DBA starts with a small, attainable task, hoping to win the advisee's trust. The DBA proceeded by working on more challenging behaviors, such as improving F's study habits.

6. Identify necessary skills or subtasks to overcome the problem behavior.

The DBA teaches the skills that the advisees would need to solve their problem and overcome their target behaviors. Whereas skill training may be part of other therapies, such as modern CBT, skill training in DBAT focuses on acquiring necessary skills to overcome problem behaviors that will allow the advisee to move up one stage. Other therapies do not address moving individuals along development stages, and the individuals' skills are not contingent upon the stage at which they perform. The DBA analyzes the subtasks that go in between the order tasks. According to the Model of Hierarchical Complexity, subtasks are actions between two consecutive orders that organize only one action from the lower order and one or more from orders below the lower order. Such coordination does not result in the higher order and are thus subtasks between two orders. The higher order tasks organize two or more actions from the immediate lower order. (Commons & Pekker, 2008).

A simple example of how skills or subtasks are identified is illustrated in case 1. One of the problem behaviors "D" and the behavioral developmental analyst worked on was getting his vehicles fixed. One of his vehicles had a broken ignition switch. The target behavior was to get the switch fixed. In order to attain the target behavior, D had to go through a series of subtasks such as knowing where to get his ignition switch fixed, how much it would cost him and such. Once D figured out the necessary steps, he was able to get the switch fixed. Thus, identifying the subtasks or necessary skills is important in overcoming the problem behavior.

Intervention. Below are the steps taken after completing the pre-steps for the intervention.

1. Setting boundaries

Setting boundaries means making the advisees aware of who is doing what and to whom. This includes learning the impact they have on others and themselves and vice-versa. For example, "D" did not realize that his partner had been diagnosed with ADHD and borderline personality disorder. He experienced his partner as unappreciative. Although he listened to everything she said and helped her in response to her hysterical requests, she always complained that he did not do enough for her. In this case, setting boundaries meant getting D to realize that his partner was not just unhappy with him, but also did not distinguish the boundary between her own suffering and what he did or did not do secondary to his own passive-aggressive behaviors. Clarifying boundaries

requires a person to have *social perspective skills*. This is the skill of understanding what other people think, feel, and reason. It requires integrating others' perspectives with one's own perspective, feelings, and actions. At the concrete stage, this is done by asking questions about what the advisee thinks, feels, and wants and what he believes others think, feel, and want.

Individuals can set boundaries only if they take the perspective of another person. People with personality disorders usually lack this skill (Commons & Barry-Heffernan, 2012). Thus, establishing boundaries is important with advisees who struggle with personality disorders.

2. Setting contingencies

Setting contingencies is the key to helping the advisee obtain the desired behavior. The DBA motivates an advisee to abandon the problem behavior and adopt the target behavior by setting contingencies that reinforce the advisee's desired behaviors. First, the DBA sets the contingencies. For example, to manage D's problem with his partner, the DBA gradually establishes contingencies. After building a therapeutic alliance, it became clear that D enjoyed talking to the DBA over the phone. However, if he responded to his partner's yelling by attending to her during the phone conversation with the DBA, the call would be ended. The contingency here was that if D responded to his partner's yelling, he did not get to talk to the DBA, an activity D greatly enjoyed. The contingency punished D's behavior of allowing his partner to interrupt his call. In this way D was trained to confront his partner and to let her know that he would address her concerns later.

As the DBA sets contingencies with the advisee's consent, problematic behaviors gradually subside. The DBA makes the advisee aware of real world contingencies, and let these contingencies serve to reinforce the target behavior. For example, the real world contingency set for F was that if F did not take measures to perform better in class, he would not attain his career goals. Once the advisee helped him realize that, he began to form study habits as advised by the DBA. Real world contingencies tend to work better than DBA-induced contingencies. They work even in the absence of the DBA. In this way, the DBA helps the advisee appreciate increasingly complex contingencies. This raises the value of the target behavior and hence helps the advisees work towards achieving the target behavior.

3. Help the advisee recognize the cost of the problem behavior

Often, advisees engage in problem behavior because they do not understand the costs of doing so. Thus, the DBA is required to recognize the cost of the problem behavior so that the DBA may help the advisee understand the economics of the problem behavior. Understanding these economics helps the advisee achieve target behaviors. For example, D did not realize the cost of not fixing the ignition switch of his partner's car. However, when the DBA pointed out to him that he needed to drive his partner everywhere no matter how trivial the errand was, he was able to get the ignition switch fixed. The problem behavior was leaving the ignition switch broken. The target behavior was getting the ignition switch fixed. Once D understood this cost to him, he was able to achieve the target behavior.

4. Measure sensitivity to reinforcement by measuring preference and use it to reinforce the target behavior.

The DBA finds out which consequences serve as effective reinforcers and punishers to change the problem behavior. Advisees are given a list of possible reinforcers and asked to rate them according to their preferences. The reinforcer with the highest rating is used to alter the problem behavior, if it is possible to manipulate the behavior. For example, in case of A, the DBA asked A what activities she was most interested. She said that she had never been asked this question by her parents. The DBA chose making her feel appreciated as one of the reinforcers. As per her preference, he also engaged in activities that she liked as reinforcers, such as eating and watching educational videos. Consequently, she did not throw fits nor hurt anyone in the presence of the analyst, when she was gratified in this manner.

5. Increasing the rate of responding in one area to increase rate of action in another.

The heart of DBAT is task analysis, which means measuring where the person is in developmental behavioral sequence and measuring the rate of activity. Often, behavior occurs in chains, that is, one behavior must be completed before the next behavior can be attempted. Rate of activity is measured by how many times a behavior occurs in a given period of time for a given task. In therapy, DBAs have to know the rate of the behavior to determine whether this rate is to be raised or lowered. Problem behaviors are lowered in rate, and non-problematic behaviors that compete are raised together with next stage behaviors. By increasing the rate of responding in one area, the DBA can help the advisee succeed in increasing the rate of behavior in another area (Premack, 1959). This helps raise the advisee's stage in the domain of the problem behavior.

6. Charting behavior and keeping to-do lists

The DBA helps advisees chart their behaviors concerning their problem behaviors. This helps them keep track of their behaviors. Seeing their progress serves as a positive reinforcement to them. Advisees are also asked to keep to-do lists. This is to help them break down their tasks into smaller steps, helping to prevent them from becoming overwhelmed. Again, checking off tasks from the to-do list serves as a positive reinforcement. These measures help advisees move forward instead of getting stuck.

7. Other supplemental therapies and training

DBAT is recommended to be used hand in hand with other therapies. DBAT has been specifically developed to treat certain behavioral problems. Hence, advisees can be advised to receive other intervention specific to their needs. Behavior interventions such as skills training, behavior management, and behavior modification can be used along with DBAT as they help advisees increase rate of action and change behaviors. Similarly, other non-exclusively behavioral interventions, such as CBT and DBT, can also be practiced with DBAT. For example, C suffered from depression due to events in his personal and professional life. In addition to

Table 1. Problem Behaviors Identified and Their Stages in the Model of Hierarchical Complexity

Advisee	Problem behavior	Stage
A	1) She threw fits by throwing things around and attacked other people.	1) Primary
B	1) He engaged in behaviors that hindered him from resubmitting his article to a journal and getting it published. He needed to resubmit his paper after a rejection from a reviewer who most of his colleagues thought was "silly". However, he did not do it.	1) Formal
	1) He watched television for 6-8 hours per day. This kept him from having a social life or doing other beneficial things.	1) Transition between formal and systematic
	2) He could not represent himself and submitted to his wife's unreasonable demands	2) Abstract
	3) He hoarded things like old computers.	3) Sentential/Concrete
	4) He held a job that required him to have leadership skills that he lacked.	4) Formal
D	1) He hoarded land, cars, flyers, garbage cans and such.	1) Sentential/ Concrete
	2) He did not take social perspective. He did not know that his partner complained all the time because she was borderline or hysterical. He was uninterested in the lives of people he ate with every day.	2) Concrete
	3) He complied with unreasonable demands of his partner who suffered from borderline personality disorder.	3) Abstract
E	1) She felt the necessity to talk about all her friends with everybody she talked to although they did not want to listen to her talk about her friends.	1) Primary
F	1) He had a study habit which did not include making a to-do list and following it. In turn, he was did not complete his assignments on time.	1) Concrete
	2) He estimated how long it would take him to finish his readings incorrectly. He did not allocate enough time nor establish a reasonable strategy to read more efficiently.	2) Abstract
	3) In order to avoid writing papers he took six classes that did not require him to write papers and dropped three out of five classes that required him to write papers.	Value issue and not stage. Overestimation of risk.

DBAT the DBA sent him to a cognitive behavior therapist to help him with his depression. After receiving both CBT and DBAT, C was able to find a position that suited his skills and feel better about his losses. Similarly, advisees can also receive non-clinical trainings that educated them about necessary skills to change their problematic behaviors. C also received leadership training, which helped him convey himself better to his supervisees. As in this example, the DBA encourages advisees to receive appropriate intervention and training.

» METHOD

Participants

All the six advisees were obtained through convenient sampling. Four of the advisees were males aged 22, 50, 53 and 72 years and two were females aged 9 and 65 years. Five of the advisees suffered from one or more of the following non-psychotic behavioral problems as diagnosed by a licensed clinician: oppositional defiant disorder, borderline personality disorder, obsessive compulsive disorder, dependent personality disorder, and depressive

Table 2. Target Behaviors and Their Stages in the Model of Hierarchical Complexity

Advisee	Target behavior	Stage
A	1) To stop throwing fits, and attacking people.	Concrete
B	1) To work towards making his paper acceptable for publishing. To look for other journals and submitting it to those journals.	Systematic
C	1) To stop watching television and engage in behavior such as socializing which are more beneficial to him.*	Systematic
	2) To represent himself better by standing up to his wife.	Formal
	3) To find a job that matches his skills (i.e. programming)	Systematic
D	1) To gradually get rid of at least some of the things he had hoarded.	Preoperational/Abstract
	2) To stand up to his wife.	Formal
	3) To take social perspective of others.	Abstract
	4) To understand that they have to be interdependent on each other. **	Systematic
E	1) To stop talking about her relationships with other people since they are not interested in listening to her.	Concrete
F	1) To study more efficiently in a more organized fashion. To make a study schedule.	Formal
	2) To correctly gage how long it will take him to complete his readings. To develop a strategy to do his readings more efficiently.	Systematic
	3) To take and complete classes that required him to write papers.	Not stage issue. Problem in assessment of risk. (see Commons & Tuladhar, 2014)

Note. *Could have been a target behavior but the DBA did not aim to achieve it because removing his television would generate an angry response from the advisee and would break the alliance he had with the DBA. **This was a target behavior set later on after target behavior 2) was achieved by D.

Table 3. Behavior after Intervention and Their Stages Before and After Intervention

Advisee	Current behavior	Stage	
A	1) Continued to throw fits and harm other people except in the presence of the DBA. She is still in the alliance building phase with the DBA.	1) Primary	1) Primary
B	1) Revised and resubmitted the paper, but the paper got rejected. He understood that he could look for other suitable journals and submit there. He submitted the paper to another journal and it got accepted.	1) Formal	1) *Systematic
C	1) There was no change in his behavior of watching television for six to eight hours per day. This was not set as a target behavior because the DBA was not physically present with the advisee and the advisee was home alone. The DBA could not change the advisee's environment to change his behavior.	1) In transition between formal and systematic	1) In transition between formal and systematic
	2) Represented himself better by standing up to his wife.	2) Abstract	2) *Formal
	3) Worked as a programmer. This job matched with his skills better.	3) Abstract	3) *Formal
D	1) Gradually got rid of at least some of the junk.	1) Sentential/ Concrete	1) *Preoperational/Abstract
	2) Could stand up to his wife.	2) Abstract	2) *Formal
	3) Could take social perspective of others.	3) Concrete	3) *Abstract
	4) ***Did not understand that he and his common law wife had to be interdependent on each other	4) Formal	4) Formal
E	1) Stopped taking about her relationships with other people and understood that they were not interested in listening to her.	1) Primary	1) *Concrete
F	1) Kept his to do list and kept it up to date intermediately. He submitted all his assignments on time.	1) Concrete	1) **Formal
	2) Finishes his readings but still has not developed a strategy to read efficiently as he takes a long time to do them.	2) Abstract	2) *Formal
	3) Started taking classes that required him to write papers. Wrote all the required papers and did not drop the class. Got good grades in all his papers. However, he continued to struggle with writing more efficiently as he took very long time to finish his papers.	3) Value issue and not stage. Overestimation of risk.	3) His value has changed since he does not overestimate the risk anymore and does not avoid writing classes anymore.

Note. *Indicates that the advisee moved up by one stage in that particular behavior. **Indicates that the advisee moved up by two stages in that particular behavior. ***This was a new behavior the DBA and D were working on after behavior 2) was achieved by D.

disorders. The remaining advisee did not suffer from any formal diagnosis but required help with developing skills to perform better at the undergraduate level.

Procedure

Problem behaviors of the advisees were identified and scored to determine the stage at which they were performing in those particular behaviors. The HCSS (Commons, Miller, Goodheart, & Danaher-Gilpin, 2005) was used to score behaviors. Target behaviors were set and scored as well. The DBA applied DBAT to help the advisees alter their problematic behaviors. Behaviors after intervention were then observed and scored. The behaviors were scored by both the authors.

Problem behaviors

The problem behaviors identified and scored are presented in Table 1.

Target behaviors

The target behaviors set and scored are presented in Table 2.

» RESULTS

Although one of the advisees remained in initial phases of the therapy such as alliance building and had not achieved the target behaviors nor moved up in stage, five of the advisees achieved their target behaviors. They also had moved up at least one stage in their problem behaviors. Behaviors before and after intervention and their respective stages in the Model of Hierarchical Complexity are detailed in Table 3.

A was still in an alliance building phase as she achieved the target behavior when she was with the DBA, but failed to do so at other times. She had not moved up in stage in her problem behavior. B, C, D, E and F all moved up a stage in their problem behaviors. F moved up two stages in studying and doing his assignments in an organized way.

» DISCUSSION

DBAT has been developed recently and has not yet been applied to a large sample. However, the positive results yielded from our small sample suggest potential benefit and success of this therapy. Among the six advisees, whose case studies have been presented in this paper, five of them successfully achieved their target behaviors. Four of the advisees moved up one developmental stage, whereas one advisee moved up two developmental stages in the behavior of interest. One of the advisees, A, did not achieve the target behavior. She was still in the alliance building phase of the therapy when the therapy was discontinued because her parents' were not willing to assist the DBA to continue the therapy. The fact that the therapy was modestly successful in five out of the six advisees suggests that DBAT is an effective therapy.

As with any new therapy, DBAT has limitations. The first is that the success of this therapy has not been experimentally tested and verified. We also used convenient sampling. The next step towards the development of DBAT would be to utilize this therapy on a larger sample with a more systematic sampling method including control samples. We suggest additional experimental studies to replicate our findings.

Another critique regarding the approach of DBAT may be that it would be difficult to conduct the therapy in a workplace. This problem can be overcome by getting consent of the workplace, as all organizational consultants do. Additionally, the therapy often does not require the DBA's actual presence in the workplace, because other modes of communication are effective in this therapy, such as telephone and Skype. As discussed previously, conducting therapies in natural settings has the advantage over conventional therapies in terms of generalizability of contingencies to other settings.

A suggestion for future research would be to examine if there is a differential effect of the mode of doing the therapy. Research topics may include whether it is less effective to conduct the therapy via telecommunication and internet than in person. Although we recognize that physical presence of the therapist is optimal in dealing with certain behaviors, such as providing advisees exposure to certain stimulus, most of the therapy can be done remotely. There have been studies that show that remote treatment of such nature have been effective in treating individuals with problems such as panic disorders (Carlbring, Bohman, Brunt, Buhrman, Westling, Ekselius, & Andersson, 2006), compulsive gambling with severe depression (Carlbring, & Smith, 2008) and, anxiety and depression (Veazey, Cook, Stanley, Lai & Kunik, 2009). ■

REFERENCES

Ainslie, G. (2008). Breakdown of will. In J. E. Adler, L. J. Rips (Eds.), *Reasoning: Studies of human inference and its foundations* (pp. 156-186). New York, NY US: Cambridge University Press.

Binder, C. (2000). *Component/composite analysis and programming from the "real world."* Paper presented at the Association for Behavior Analysis, Washington, DC.

Carlbring, P., & Smit, F. (2008). Randomized trial of internet-delivered self-help with telephone support for pathological gamblers. *Journal of Consulting And Clinical Psychology*, *76*(6), 1090-1094. doi:10.1037/a0013603

Carlbring, P., Bohman, S., Brunt, S., Buhrman, M., Westling, B. E., Ekselius, L., & Andersson, G. (2006). Remote treatment of panic disorder: A randomized trial of internet-based cognitive behavior therapy supplemented with telephone calls. *The American Journal of Psychiatry*, *163*(12), 2119-2125. doi:10.1176/appi.ajp.163.12.2119

Commons, M. L., Barry-Heffernan, T. (2012, July). *A model of stage and value to predict behavior*. The Society for Mathematical Psychology, Columbus, Ohio.

Commons, M. L., Miller, P. M., Goodheart, E. A., & Danaher-Gilpin, D. (2005). *Hierarchical Complexity Scoring System: How to Score Anything.* Retrieved from http://dareassociation.org/Papers/Scoring%20Manual.htm

Commons, M. L. & Pekker , A. (2008). Presenting the formal theory of Hierarchical Complexity. *World Futures: The Journal of Global Education*, *64*(5-7), 375–382

Commons, M. L. & Tuladhar, C. T. (2014). Developmental Behavior Analytic Therapy: Easier Done than Said. *Behavioral Development Bulletin, 19(2).*

Commons, M. L., Woodford, M., & Ducheny, J. R. (1982). How reinforcers are aggregated in reinforcement-density discrimination and preference experiments. In M. L. Commons, R. J. Herrnstein, & H. Rachlin (Eds.), *Quantitative analyses of behavior: Vol 2. Matching and maximizing accounts* (pp. 25-78). Cambridge, MA: Ballinger.

Fischer, K.W., Hand, H.H., & Russell, S. (1984). The development of abstractions in adolescence and adulthood. In M. Commons, F.A. Richards, and C. Armon (Eds.), *Beyond formal operations* (pp. 43-73). New York: Praeger. New York: Freeman.

Linehan, M. M. (1987). Dialectical Behavior Therapy for borderline personality disorder: Theory and method. *Bulletin of the Menninger Clinic*, *51*(3), 261-276

Logue, A. W. (1988). Research on self-control: An integrating framework. *Behavioral and Brain Sciences*, 11(4), 665-709. doi:10.1017/S0140525X00053978

Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. In M. L. Commons, J. E. Mazur, J. A. Nevin, & H. Rachlin (Eds.), *Quantitative analysis of behavior: Vol. 5. The effect of delay and of intervening events on reinforcement value*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Premack, D.(1959). Toward empirical behavior laws: Positive reinforcement. *Psychological Review*, *66*, 219-233.

Rosales-Ruiz, J. (2000, May). Divide and teach. In M. Commons (Chair), *Fluency of elements and cusps during acquisition of compounds: An empirical account of development*. Symposium conducted at the 26th International Meeting of the Association for Behavior Analysis. Washington, DC.

Rachlin, H. (2006). Notes on discounting. *Journal of the Experimental Analysis of Behavior*, *85*(3), 425-435. doi:10.1901/jeab.2006.85-05

Rosales-Ruiz, J., & Baer, D.M. (1997). Behavioral cusps: A developmental and pragmatic concept for behavior analysis. *Journal of Applied Behavior Analysis*, *30*(3), 533–544.

Skinner, B. F.,Vaughan, M. E. (1983). *Enjoy old age: A program of self-management*. New York, NY: W W Norton & Co Inc.

Thompson, G. (2012). Family-centered music therapy in the home environment: Promoting interpersonal engagement between children with autism spectrum disorder and their parents. *Music Therapy Perspectives, 30*(2), 109-116.

Veazey, C., Cook, K. F., Stanley, M., Lai, E. C., & Kunik, M. E. (2009). Telephone-administered cognitive behavioral therapy: A case study of anxiety and depression in Parkinson's disease. *Journal Of Clinical Psychology In Medical Settings, 16*(3), 243-253. doi:10.1007/s10880-009-9167-6

APPENDIX 1: CASE STUDIES

Case 1: D

D was a 72 year old man who suffered from dependent personality disorder and hoarding. His partner suffered from borderline personality disorder. His partner pushed him around and constantly yelled at him with her hysterical demands. He complied, often after long delays, with her demands. However, she never gave him credit for anything he did for her. For example, he drove her everywhere even though she had her own car and accompanied her to church events against his wishes although he was an atheist. She never appreciated him for any of those things he did for her. She complained that he did not love her or care for her constantly. Sometimes, he would yell back or walk out when he could not handle her behavior. His main defense was to ignore her as long as possible and literally forget unpleasant things. At some point, he did do what she asked after even more yelling. He tried to stay away from her and took care of a few stray cats instead.

He also suffered from OCD as shown by his hoarding of junk things. He had four cars in his yard that did not function. Only two could be fixed but he never had them fixed. He used one side of his house for storage and three garages. He also had a large storage container. His yard was full of random things, such as a toilet and a compressor. He also had poor hygiene. He washed his sheets once in six months. He had no heat nor hot water in the apartment because he did not get the drain fixed or the gas turned on. Instead, he would use space heaters and shower downstairs where there was hot water.

He also lacked social perspective taking skills as he had no idea that other people were different from him. He did not realize that other people see the world differently than he did. He assumed that everyone was rational. He did not understand that his partner would never be satisfied with anything he did and that she would always have a fear of abandonment because she suffered from borderline personality disorder. He thought she was eccentric but did not realize that she had serious problems.

When D started therapy, the DBA asked him how he was feeling. He asked him about his problems. This helped the DBA gain D's perspective. This was something that neither D's partner nor anyone in his family ever did. The DBA talked to him every day and checked up on him. The DBA listened to what D had to say and kept track of where he was and what he was doing. This assured D that the DBA cared. These approaches helped the DBA form an alliance with D.

To form an alliance, D enjoyed talking to DBA over the phone which happened regularly.

It took the DBA a long time to help D see how his way of dealing with his partner was problematic and that he has a hoarding problem. First the DBA helped him set boundaries regarding his partner. He began to realize that he was being taken advantage of by his partner in certain cases. He helped him understand that his partner was much more mentally ill than he thought. To manage his problem with his partner, the DBA had him gradually set contingencies. However, if he responded to his partner's yelling by attending to her during the time he talked to the DBA on the phone, the DBA would hang up. He was trained not to confront his partner but tell her that he wanted to talk/attend to her, but not right at that moment. After the intervention, D stood up for himself more. For instance, one day D was watching a television show. His partner wanted him to make falafel and stop watching television. However, he finished the show first and then afterward made falafel. In this occasion he stood up for himself and gained independence from conforming to his partner all the time. After the therapy, he was aware that he was being manipulated by his partner. He expressed his anger better as he was no longer passive. He stood up to his partner. This was the first behavioral change D achieved. The next step was to make him understand that he and his partner had to be interdependent on each other to have a better functioning relationship. D had not realized it yet.

He also became a house supervisor for a place where mentally ill people lived and realized that there were people who were more severely mentally ill than he thought.

After building the alliance and helping D set boundaries, the first step the DBA took was to break down everything he had to do into small steps. The DBA made a to-do list for D because D was not good at typing. When the DBA visited him, had days when they recycled some of the things D had hoarded. They bought a battery operated hedge trimmer and weed whacker. They trimmed hedges together. The DBA would check on how many of the tasks on the list were done frequently. This helped D make his life more manageable despite his OCD.

Similarly, his hoarding habits improved dramatically. As a result of the therapy he threw flyers out and recycles things. He sold some property to obtain more cash. He painted his house and replaced all the refrigerators and doors. He got this roof fixed and got a lot of plumbing done. He kept his computers updated with antiviruses. He remained a hoarder but, his hoarding became much more manageable after the therapy. He also improved in understanding and taking perspective of others.

Case 2: A

A was a 9 year old, who was diagnosed with oppositional-defiant disorder. Her behavior was very problematic as she threw fits by throwing things around and attacking other people. She had authoritarian, punitive parents who got extremely angry when she protested or threw fits. Her parents suffered from terminal narcissism and anger as diagnosed by a licensed clinician. Her parents were not willing to put her under her paternal uncle's care although the uncle would have been a better care taker and had volunteered to take her in.

The DBA recognized her throwing of things and hurting of other people as the problem behavior. A was not aware that it was a problem behavior. The DBA, started building an alliance with her by asking her how she would like to spend the day. He listened to her and planned her day according to what she wanted to do. He made her feel heard. Unlike her parents, the DBA was non-confrontational and patient with her. He did not force her to do things that she did not want to do and involved her in making rules for herself. He maintained good behavior in her through differential reinforcement and reinforcing behaviors other than acting out. For

example, he asked her what she wanted to do and made her do what she thought were fun activities. She was appreciated by the DBA. This was highly reinforcing to her. He became a high source of reinforcement. He set the contingencies that he was confident would work based on the preferences A expressed. She did not fight with him. She never acted out when she was with the DBA. Before the completion of the therapy, her parents got her out of it. She continued to throw fits and harm other people in the absence of the DBA because she was still in pre-steps for intervention phase with him when the therapy ended.

Case 3: F

F was a very smart 22 year old attending *Harvard Extension School of Harvard University*. However, he was struggling to form good study habits. He had problems concentrating, planning, work attack and completion. As a result, his grades had suffered. This hindered him from working towards his future goal of being admitted to *Harvard Extension School of Harvard University* to complete college and then attending graduate school. He had no clue about how to work on improving his grades. He had difficulty in gaging how long the readings would take him or how difficult they were. As he approached the middle of the semester, he fell behind on most of his assignments and readings. He also avoided taking classes that required him to write papers for classes because he said he was afraid of criticism of his work. This was true in spite of one of his goals in life to a fiction writer.

At the time F started the therapy, he had been a high school intern working for the DBA in a research organization. F started forming an alliance with the DBA as the DBA took interest in his life and what he was struggling with. The alliance got stronger as the DBA took him to a grant proposal workshop. The DBA was successful in building an alliance with H as the DBA was helping him gain necessary skills to move forward in his career path. At the workshop, F got an opportunity to meet different people in academia. He realized how far he had to go in terms of reading and writing academically to build a career in research. Initially, F was unsure whether he could get all the work done for the workshop. However, the DBA frequently checked up on him to see how much he had done. The DBA would go over his work. In the end, he succeeded in completing the workshop. On completing the workshop, F began trusting the DBA. It helped F build a stronger alliance with him. This is an example of how the DBA starts with a small, attainable task first that helps the DBA win the advisee's trust. After this, the DBA proceeded on to altering more challenging behaviors such as changing F's study habit.

Once the alliance was built, both the DBA and F agreed that the target behavior was to change F's study habit in order for F to perform better in his classes. The natural *Harvard Extension School* contingency set here was that if F did not take measures to perform better in class, he would not attain his career goals. If he did perform better, he would be admitted to the regular program. First, the DBA had F come in on Sundays to study under the DBA's supervision. He had him keep track of the hours he put into doing his readings. This helped him become more conscientious of how much time he required to do his readings. He made a to-do list which helped him see how much he had done and organize and plan how much he needed to do. The DBA checked in with H everyday about how he was doing in terms of getting his readings and assignments done. The DBA gave him tips on how to aim at finding out what the professors looked for in his work.

The DBA also took him orienteering which requires one to concentrate, plan routes to get to the controls and stay highly motivated in order to complete the routes. Developing these skills in this area helped him apply those skills in other areas as well. After this intervention, F did not fall behind on his work as much as he used to before the intervention. Even if he did fall behind sometimes, it was easier for him to get back on track. He had no assignment turned in late and got perfect scores on all his assignments except one of them. He kept his to-do list. He finished his readings, but had not developed a strategy to read efficiently as he took a long time to do them. He also started taking classes that required him to write papers. He wrote all the required papers and did not drop classes. He got A's and A-'s in all his classes post intervention.

Case 4: C

C was a 50 years old radiological physicist who worked on writing programs for radiological treatment. He obtained his graduate degree from a prestigious university. However, he had four competing behaviors when he first met the DBA. The first was that he watched six to eight hours of television every day. This kept him from having a social life and doing other beneficial things. Second was that he had problems representing himself. He agreed with everybody and accepted responsibility for things he was not responsible for. Later after being married, he submitted to unreasonable demands made by his wife. Third was that he had OCD and was a hoarder. He collected every computer that he ever owned. Fourth was that he held a job that did not match his skills. It required him to have leadership skills that he lacked.

During the beginning of the therapy, C was clinically depressed. He was on the verge of getting fired from work. He was in a supervising position, but was not a good supervisor. He had recently separated from his wife. His wife was abusive and extremely controlling. She constantly yelled at him and told him that he was no good. She tried to control his activities to such an extent that she would not let him eat junk food with his daughter occasionally. They sent their daughter to a private school even if it meant putting a financial strain to their household. They had to give up the house they were renting out in order to afford living closer to their daughter's school. Even after the separation, he seemed to have little say over his daughter's life or how they should treat his daughter.

The therapist began by making a routine to talk to him every day and check up on him. They came up with a plan and recognized what they wanted to fix together. Together they recognized the target behaviors as to have a say in his daughter's life and to find a more suitable position where he worked. The DBA helped him set boundaries and see that he was not solely responsible for his marital problems. He realized that it was also because his wife had problems. The DBA helped him understand that as the father, he could do what he wanted with his daughter and that his wife should not affect how he interacted with his daughter after the separation. He went over the worst scenario that could take place

if he stood up for himself against his wife. This helped him reduce some of his anxiety regarding standing up for himself. The DBA also got him to see a cognitive behavior therapist to help him with his depression and OCD. The DBA also supported his decision to go to Toastmasters International, where he learned public speaking and leadership skills.

After the intervention, he learned to represent himself much better. He talked more with his wife and sometimes represented his view. They remained separated. He did what he pleased to do with his daughter regardless of how his wife felt. For example, he ate junk food with her and let his wife know when she asked him about it instead of lying to her. The three of them did do activities together as family during weekends. He spent his time in her apartment. At work, he did not get fired, but did get demoted. He now just programs rather than leading a team. He started going to work on time. He did as well as he could in his job and communicated with his boss and let him know what he was doing. The DBA helped strengthen his own view that he was a great programmer and working as a programmer would be a better match for him. Thus, C worked as a programmer instead of a supervisor.

He also applied to law school to become a patent attorney. He also started taking online classes. When asked to rate how depressed he was on a scale of 1 to 6 with 1 being totally depressed and 6 being very happy, he rated 4 after intervention and 3 before intervention. When asked how he was performing at work on a scale from 1 to 6 with 1 being going to get laid off and 6 being his bosses love him, he rated himself as 4 after intervention. He still spends the same amount of time watching television. However, the DBA did not aim to alter that behavior because C was by himself in the house and the analyst intervened through telephone and video call software. They lived in different geographical locations. Changing the behavior might require the DBA to change C's environment which was not possible.

This case study illustrates how DBAT can work hand in hand with other types of therapies. In C's case, the Cognitive Behavior Therapy helped him with his depression and OCD. The training he received from Toastmasters International helped him represent himself better. The supervision he got from the DBA helped him establish boundaries which helped him empower himself as a father and realize that the failure of his marriage was not entirely because of him. He is moving on with his life by going to law school.

Case 5: B

B was a 53 year old psychiatrist who suffered from not getting work done. He did not know to get help from others about how to bring his ideas to a larger audience. He had a chance to publish a paper he gave at a meeting in an international journal. However, he lacked social perspective taking skills. He described everything in terms of his own personal experience. He wrote a paper that was 90 pages long including all the cases he had taken which were not remotely related. The DBA was able to build an alliance with him as they worked together in a number of things professionally. However, B never agreed with the DBA that his goal was to get his paper published. The time pressure to finish his paper overwhelmed him. The DBA helped him get help from a colleague who helped him cut the paper down and format it according to American Psychological Association (APA) style. The paper was accepted with pending revisions. B finally resubmitted the paper. However, B even when he finally did the revisions, they rejected the paper. He presented it at another meeting and they asked him to submit a manuscript. He submitted a revised version of the manuscript that had been rejected. B finally realized at that time that his paper might have been a better fit for the second journal. When they asked for revisions, he put the revisions into a letter rather than into the manuscript. After about four tries, the DBA and his other colleague convinced him to make the changes in the manuscript directly. The DBA worked with B in helping him realize it. By the end of the intervention, B finally submitted his paper to a different journal and was accepted. What worked in this case was having an alliance and giving lots of direct suggestions and following up if the suggestions were followed

Case 6: D

D was a 65 year old woman suffering from borderline personality disorder. Her mother suffered from severe depression. Her father had died when she was very young and her mother got remarried. When her mother went to a mental hospital, her step father covered it up. At the age of 18, her stepfather made her leave the house. She had a long line of very disturbed family relations. She had many cousins who were abandoned. She was constantly afraid that her partner did not care about her and that he would abandon her. She lacked social perspective taking skills as she did not understand that her partner would not abandon her. She would yell at him all the time to get him to do things around the house. She was jealous of most people who had any kind of relationship with her partner. However, she wanted many people in her own life. She also suffered from OCD.

She wanted someone to help her get the virus off her computer. The DBAs volunteer to help her. Her problem was that she wanted to talk about who she had met and how important they were and how nice they were to everybody. This made it difficult for people to work with her. She talked at people and told her life story to them over and over again. She had the compulsion to tell people all the new things going on with her new friends. In this way, she got off track and never ended up working on getting the virus off her computer. D and the DBA build an alliance as the DBA helped her fix her computer. The target behavior was to prevent her from getting distracted by her compulsion to talk about the people she met. The DBA gave her two choices. She was told that either he would help her get the virus off, or that he would not work with her if she kept going off topic. She realized that there would be real consequences if she kept talking, and she chose to take care of the virus first. Then the two could stay focused and work together. The removal of the virus served as a reinforcer for inhibit going off onto tangents. This is a case where one lets real world consequences work as the reinforcer. The consequence made her realize that talking did not get the job done but focusing did. As a result, she could focus on what needed to be done as opposed to having to report on all the people to others. Also setting limits help make the boundaries between herself and the person helping her clearer.

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

An evaluation of multiple exemplar instruction to teach perspective-taking skills to adolescents with Asperger Syndrome

Sadie Lovett[1] and Ruth Anne Rehfeldt[2]

1 Central Washington University
2 Southern Illinois University

ABSTRACT

The goal of this study was to investigate the effects of multiple exemplar instruction for teaching perspective-taking skills to young adults with autism. Using a multiple probe design, participants were trained and tested using protocols evaluating the deictic frames of I-You, Here-There, and Now-Then. Generalization of perspective-taking skills was evaluated using two standardized assessments designed to evaluate theory of mind, which were administered at pre and posttest. Generalization of perspective-taking skills to a more natural language situation was also assessed. Results showed the emergence of perspective-taking for all participants following multiple exemplar instruction, and varying degrees of generalization of perspective-taking skills to a natural presentation of social interaction were observed based on the complexity of the perspective-taking relation.

KEYWORDS: multiple exemplar instruction, perspective-taking, deictic relations

Deficits in social interaction and communication are two of the defining features of autism spectrum disorders (American Psychiatric Association, 2000). For instance, individuals with autism often struggle with perspective-taking skills, such as reading emotion in others, deceiving or understanding deception, and anticipating what others might think of one's actions (Downs & Smith, 2004; Howlin, Baron-Cohen, & Hadwin, 1999). If not addressed, deficits in social skills can result in a minimal number of friendships and peer relationships (Orsmond, Wyngaarden Krauss, & Mailick Seltzer, 2004). Additionally, low levels of self-perceived social competence are observed to occur in individuals with diagnoses of high-functioning autism or Asperger syndrome who have average or above average intellectual abilities (Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007).

Cognitive researchers have traditionally described perspective-taking skills as resulting from a theory of mind (ToM) that emerges naturally throughout the course of typical development. Perspective-taking deficits observed in individuals with autism are, therefore, considered to be a result of a deficit in the ToM construct (Howlin et al., 1999). Cognitive researchers have developed a variety of methods to assess ToM, but have been unsuccessful in teaching perspective-taking to children with autism in a manner that will promote generalization of skills (Yun Chin & Bernard-Opitz, 2000).

Author note: This project is based on a dissertation completed by the first author under supervision of the second author in the Rehabilitation program at Southern Illinois University. Address correspondence to: Sadie Lovett, PhD., BCBA-D, Psychology Department, Central Washington University, Ellensburg, WA 98926-7575. lovetts@cwu.edu.

The behavioral approach to perspective-taking based on Relational Frame Theory (RFT) offers an analysis of this behavior that is directly aimed at promoting generality of learning (Hayes, Barnes-Holmes, & Roche, 2001). According to RFT, perspective-taking is verbal behavior or derived relational responding, which involves responding to relations between stimuli in the absence of a history of direct reinforcement for responding to those particular relations. Although derived relational responding to novel stimuli is not directly reinforced, it is considered generalized operant behavior that is learned from a history of reinforcement for engaging in relational responding (Hayes et al., 2001). A specific type of derived relation, called a deictic relation, is the basis for perspective-taking behavior. Deictic relations involve a specification of the stimuli to be related based on the perspective of the speaker as opposed to the formal properties of the stimuli. For example, the perspective of the speaker is key to understanding relations such as left versus right or mine versus yours (Hayes, Fox, Gifford, Wilson, Barnes-Holmes, & Healy, 2001). A relation such as *mine-yours* is always dependent on the point of view of the speaker as the individual to which *yours* refers will constantly change throughout the course of different social interactions.

The RFT perspective-taking literature to date has emphasized the analysis of three specific types of deictic relations related to person, place, and time, which are I-You, Here-There, and Now-Then (McHugh, Barnes-Holmes, & Barnes-Holmes, 2004). These deictic relations are evaluated according to simple, reversed, and double reversed levels of relational complexity. An example

of a simple relation is, "I have a red brick and you have a green brick. Which brick do I have? Which brick do you have?" An example of a reversed relation is, "I have a red brick and you have a green brick. If I was you and you were me, which brick would I have? Which brick would you have?" Double reversed relations involve the combination of two reversed relations. An example of a double reversed relation is, "I am sitting here on the blue chair and you are sitting there on the black chair. If I was you and you were me and if here was there and there was here, where would I be sitting? Where would you be sitting?" (McHugh et al., 2004).

According to RFT, a history of instruction using multiple exemplars is necessary to engage in derived relational responding and deictic relations. In multiple exemplar instruction (MEI) direct reinforcement is provided for responding relationally to certain stimuli. Following a sufficient history of contacting reinforcement, an individual is able to respond relationally to novel stimuli in the absence of direct reinforcement for that particular response (Hayes, Fox, et al., 2001). An instructional program relying on MEI has been recommended for teaching perspective-taking skills to children with autism. McHugh, Barnes-Holmes, and Barnes-Holmes (2009) outlined an instructional sequence based on the McHugh, Barnes-Holmes, and Barnes-Holmes (2004) protocol that included instruction on all three types of deictic relations (i.e., I-You, Here-There, and Now-Then) and all three levels of relational complexity (i.e., simple, reversed, and double reversed).

The use of MEI in teaching perspective-taking skills has been shown to be effective in typically developing children. Davlin, Rehfeldt, and Lovett (2011) taught deictic relational responding incorporating multiple exemplars to children between 5–7 years using a perspective-taking protocol developed from children's storybooks. Following instruction, all three participants met criterion on simple, reversed, and double reversed relations. Weil, Hayes, and Capurro (2011) used multiple exemplars to instruct children between 4–5 years to respond relationally using the McHugh et al. (2004) protocol and observed improvements in relational responding for all participants. Additionally, these authors conducted pre- and posttest evaluations of TOM performance using tasks from the cognitive literature, and following instruction, all children showed some improvements in performance on the TOM tasks. Both the investigation by Davlin et al. (2011) and Weil et al. (2011) lend support to the use of MEI to teach perspective-taking skills, and the results of Weil et al. demonstrated generalization of deictic responding to novel TOM tasks. The utility of MEI for teaching this skill to individuals with autism remains to be evaluated.

In order to gain further knowledge regarding the instructional history needed to teach perspective-taking skills, the current study addressed two issues. The primary goal of the study was to evaluate the use of MEI to teach perspective-taking skills to adolescents with Asperger syndrome. A secondary aim was to examine generalization of perspective-taking skills following instruction. Generalization was assessed using standardized assessments evaluating TOM performance. As well, generalization of deictic responding to a more natural social interaction format was evaluated.

» METHOD

Participants and setting

Participants were three young adults diagnosed with Asperger syndrome ranging in age from 17–18 years. School records indicated that all participants read at grade level, and no reading comprehension difficulties were observed throughout the course of this study. Participants were recruited from a boarding school for adolescents located in Southern Illinois, and diagnoses were verified using school records. Gift cards to a local store were provided to participants as compensation for their time.

Sessions were 30–45 min in duration and were conducted one to three times per week during the participants' school day. Participation in the entire study ranged from four to six weeks for the three participants. Sessions were held in an office on the campus of the boarding school. The office was located in a school building, contained a desk and three chairs, and was approximately 3 m × 4 m. Participants sat at the desk for the duration of the session, and all distractions were removed from the room (e.g., iPod, cell phone, peers). The option of taking a short 3–5 min break was offered at minimum every 15 min during the session.

Apparatus and stimulus materials

Instructional and testing perspective-taking protocols were presented on a laptop computer equipped with an external mouse, and the keyboard of the laptop was covered. Instructional and testing protocols were created using Microsoft PowerPoint and programmed using the Microsoft Visual Basic Editor. Each trial included a picture from the Social Language Development Scenes Adolescent therapy cards, which depict situations and social interactions that are developmentally appropriate for adolescents between 12–18 years of age (LinguiSystems, 2011). Each trial also included two to four sentences describing the perspective of the character(s) in the picture as well as a question regarding the perspective of the character(s). Textual response options for answering the question were presented on four buttons located along the bottom of the screen.

Experimental design

A concurrent multiple-probe design across participants (Horner & Baer, 1978) was used in this study in conjunction with scores from standardized assessments (Twohig, Schoenberger, & Hayes, 2007). All participants were exposed to an initial pretest probe that included simple, reversed, and double reversed relations following which, instruction commenced for the first participant. Following the demonstration of mastery criterion on the instructional protocol by the first participant, posttest probes were conducted for all participants. When the performance of the first participant reached criterion on the posttest probe, instruction began for the second participant. The administration of test probes and the introduction of instruction was conducted in this manner for the third participant as well.

Dependent measure and reliability

The primary dependent measure in this study was the percentage of correct responses on pre and posttest probes for simple, reversed, and double reversed relations. A correct response consisted of making an appropriate selection on the PowerPoint

slide by clicking on one of the four response options with the mouse. The criterion for inferring mastery of deictic relational responding was 80% on simple, reversed, and double reversed relations. Interobserver agreement was not calculated during test probes or instruction because all procedures and data collection were automated. Secondary measures included scores on two standardized instruments, the *Social Language Development Test Adolescent* (SLDT-A; Bowers, Huisingh, & LoGuidice, 2010) and *Theory of Mind Inventory* (TOMI; Lerner, Hutchins, & Prelock, 2010), as described below. The percentage of correct responses on generalization probes evaluating simple, reversed, and double reversed relations was also examined. Interobserver agreement was collected for both pre and posttest generalization probes and was calculated by dividing the number of trial-by-trial agreements by the total number of trials and multiplying that value by 100%. Interobserver agreement was collected for at least 30% of generalization probes for each participant. The mean percentage of agreement for all participants was 100%.

Procedure

Perspective taking protocol. Testing and instructional perspective-taking protocols specifically created for the developmental level of the participants were used in this study. As stated previously, the protocols designed for this study were developed using the Social Language Development Scenes Adolescent therapy cards (LinguiSystems, 2011) in order to create relevant perspective-taking scenarios. Each trial in the current protocols included a picture from the Social Language Development Scenes Adolescent therapy cards that was presented at the top of the computer screen. A brief statement describing the relevant activities, locations, and feelings of the characters depicted in the picture was presented in the center of the screen, and a question regarding perspective appeared below the statement. Four buttons containing response options appeared along the bottom of the screen.

The testing protocol (see Appendix A) and instructional protocol (see Appendix B) each consisted of 36 trials. Both protocols included the three types of deictic frames (i.e., I-You, Here-There, and Now-Then) and the three levels of relational complexity (i.e., simple, reversed, and double reversed) used in the McHugh et al. (2004) protocol. The I-You relations require a change in perspective between the participant and a character in the scenario as well as a change in perspective between different characters in the scenario. An example of an I-You relation is as follows: "Ms. Foster is glad because she enjoys watching her students give presentations. Travis is nervous because he is reading a paper in front of class. Kelly is relieved because the teacher did not ask her to read her paper. Fred is worried because he doesn't want Ms. Foster to catch him with his phone in class.

How does Travis feel?" Here-There relations require the participant to change perspective between different locations described in the scenario. An example of a Here-There relation is as follows: "Ryan is worried because there at school he has not found a date to the dance. Here at the dance Ryan is pleased because he asked Peggy to go with him. Todd is anxious because there on the bus he was talking to Dolly. Here in the cafeteria Todd is excited because Dolly said she would go to the dance with him.

How does Ryan feel there?" The Now-Then relations require the participant to change perspective between different times presented in the scenario. An example of a Now-Then relation is as follows: "Before, Cassie was disappointed because she couldn't find a good book at the library. Now, Cassie is pleased because the librarian helped her find a good book. Yesterday, the librarian was upset because she lost her glasses. Now, the librarian is relieved because a friend found her glasses. How does Cassie feel now?"

Relational responding according to each of the three types of deictic frames was evaluated and instructed according to the three levels of relational complexity. Simple relations require no change in perspective, and ask the participant to respond directly to the information specified in the scenario. All three of the examples presented in the previous paragraph for I-You, Here-There, and Now-Then relations are simple relations. Reversed relations require the participant to change perspective according to one deictic frame (i.e., either I-You, Here-There, or Now-Then) in order to respond correctly. An example of a Now-Then reversed relation is as follows: "Before, Cassie was disappointed because she couldn't find a good book at the library. Now, Cassie is pleased because the librarian helped her find a good book. Yesterday, the librarian was upset because she lost her glasses. Now, the librarian is relieved because a friend found her glasses. If now were then, how would Cassie feel now?" Double reversed relations require the participant to change perspective according to two deictic frames. Three forms of double reversed relations can be evaluated based on the three deictic frames: I-You/Here-There, I-You/Now-Then, and Here-There/Now-Then. An example of an I-You/Here-There double reversed relation is as follows: "Eric is angry because here by his locker he cannot open his combination lock. There in the classroom Eric is thankful that Jennifer returned his lunch money. Jennifer is concerned because here in the hallway she found money on the floor. There in gym class Jennifer is embarrassed because she forgot to bring a change of clothes.

If Eric were Jennifer and if here were there, how would Eric feel here?" Responses to simple, reversed, and double reversed relations were made by clicking on one of the four response options at the bottom of the screen.

Unlike previous versions of the perspective-taking protocol that included two questions per trial, the protocols created for this study included only one question per trial. For example, in previous protocols a simple I-You relation included two response options and two questions regarding the perspectives of both relevant individuals, such as, "Travis is nervous because he is reading a paper in front of class. Kelly is relieved because the teacher did not ask her to read her paper.

How does Travis feel? How does Kelly feel?" Weil et al. (2011) noted that a correct response to the first question of a trial could serve as a discriminative stimulus and occasion a correct response on the second question of the trial. Presenting one question per trial avoided this issue and ensured that participants were responding according to the appropriate deictic relation on all questions. Although the training and instructional protocols in Appendices A and B show two questions following from each scenario, the questions were presented as separate trials, and presentation of the trials was randomized in order to ensure that participants were responding relationally.

Pre and posttest probes. Test probes were administered before and after each participant mastered the instructional relations. Pre and posttest probes were presented in an identical manner using the testing protocol presented in Appendix A. The testing protocol included a total of 36 trials with 12 trials of each simple, reversed, and double reversed relations. All 36 trials of the testing protocol including the three levels of relational complexity were completed in a single session. For simple and reversed relations, there were 4 trials for each I-You, Here-There, and Now-Then frames. For double reversed relations, there were 4 trials for each I-You/Here-There, I-You/Now-Then, and Here-There/Now-Then frames. The 36 trials of the testing protocol were presented in a predetermined random sequence, and no feedback on response accuracy was provided. Prior to the presentation of test probes, the following instructions were presented on the computer screen: "You are about to read some stories and answer questions about those stories. To answer the questions you will click on one of the buttons at the bottom of the screen with the computer mouse. You won't be told whether your answers are correct or incorrect, but please do the best you can."

Multiple exemplar instruction. The independent variable consisted of MEI using the previously described instructional protocol and was introduced for the first participant when pretest probe performance was observed to be visually stable. Instruction commenced for subsequent participants when pretest probe performance was visually stable and when the participant in the previous tier of the multiple probe design showed mastery of the posttest probe relations. The instructional protocol is presented in Appendix B and included a total of 36 trials with 12 trials of each simple, reversed, and double reversed relations. For simple and reversed relations, there were 4 trials for each I-You, Here-There, and Now-Then frames. For double reversed relations, there were 4 relations for each I-You/Here-There, I-You/Now-Then, and Here-There/Now-Then frames. Instruction for each level of relational complexity was introduced sequentially. Instruction on simple relations was conducted first, and when the participant performed at or above mastery criterion for three consecutive presentations of the simple relations, instruction on reversed relations was introduced. Training for reversed and then double reversed relations was conducted in the same manner as for simple relations. Mastery criterion for all levels of relational complexity was 80%. Following performance at mastery criterion for three consecutive presentations of the double reversed relations, the full instructional protocol, including simple, reversed, and double reversed relations, was presented. Participants were assumed to have mastered the relations when performance on simple, reversed, and double reversed relations reached 80% or above for three consecutive presentations of the full instructional protocol.

Instructional trials were presented in a predetermined random sequence. During instruction automated feedback and error correction were delivered. Following correct responses the word "Correct" appeared on the screen. Following incorrect responses the words "Try Again" appeared on the screen, and the trial was re-presented until the participant responded correctly. Prior to the presentation of the instructional protocol, the following instructions were presented on the screen: "You are about to read some stories and answer questions about those stories. To answer the questions you will click on one of the buttons at the bottom of the screen with the computer mouse. This time you will be told whether your answers are correct or incorrect. Please do the best you can."

Pre and posttest generalization probes. Generalization probes were conducted at the beginning of the study before the initial pretest probes for perspective-taking were presented and again following each subsequent pretest and posttest probe for perspective-taking. Generalization probes consisted of a video presentation of three scenarios the participants could potentially encounter in daily life, and university students enacted all scenarios. Each of the three scenarios included two questions for each simple, reversed, and double reversed relations for a total of six trials. Trials required the participant to report how one of the actors in the scenario felt. The first scenario included probe questions for simple and reversed I-You relations as well as double reversed I-You/Here-There relations, the second scenario included probe questions for simple and reversed Now-Then relations as well as double reversed I-You/Now-Then relations, and the third scenario included probe questions for simple and reversed Here-There relations as well as double reversed Here-There/Now-Then relations. Although each scenario included six questions, each question was scored as a separate item for a total of 18 generalization probe trials (6 simple, 6 reversed, and 6 double reversed trials). Descriptions of each scenario and a list of generalization probe trials are presented in Appendix C. After the participant observed each scenario, a sheet of paper with four text response options was presented. The experimenter presented each probe question orally, and the participant responded by circling one of the text response options.

If the participant did not perform at or above the 80% mastery criterion on the initial administration of the posttest generalization probes, additional information regarding the emotion experienced by the actors in the videos was provided. This information consisted of orally providing the appropriate tact for the emotion each actor felt during each scene in the video after the participant viewed the video. The tact for each emotion was provided to Sarah and Brent on the third administration of the generalization probes at posttest and to Douglas on the second and third administrations of the generalization probes at posttest.

Pre and posttest standardized assessments. The SLDT-A and TOMI were administered at the beginning of the study before the pretest probe for perspective taking was presented and again at the end of the study after the final posttest probe for perspective taking was presented. The experimenter conducted all standardized assessments. Training in implementation of the assessments included review of the instructional manual and assessment materials as well as practice sessions with a pilot participant.

Social Language Development Test Adolescent. The SLDT-A is a standardized instrument that measures social language skills related to TOM for children between 12–17 years. The first subtest of the SLDT-A evaluating making inferences about the thoughts and feelings of others was completed. Individual items within a subtest are scored with a numerical value of 0 or 1 with higher scores indicating a greater degree of social language skills, and the scores from individual items are combined to create an overall score for each subtest. Scales are provided to determine age

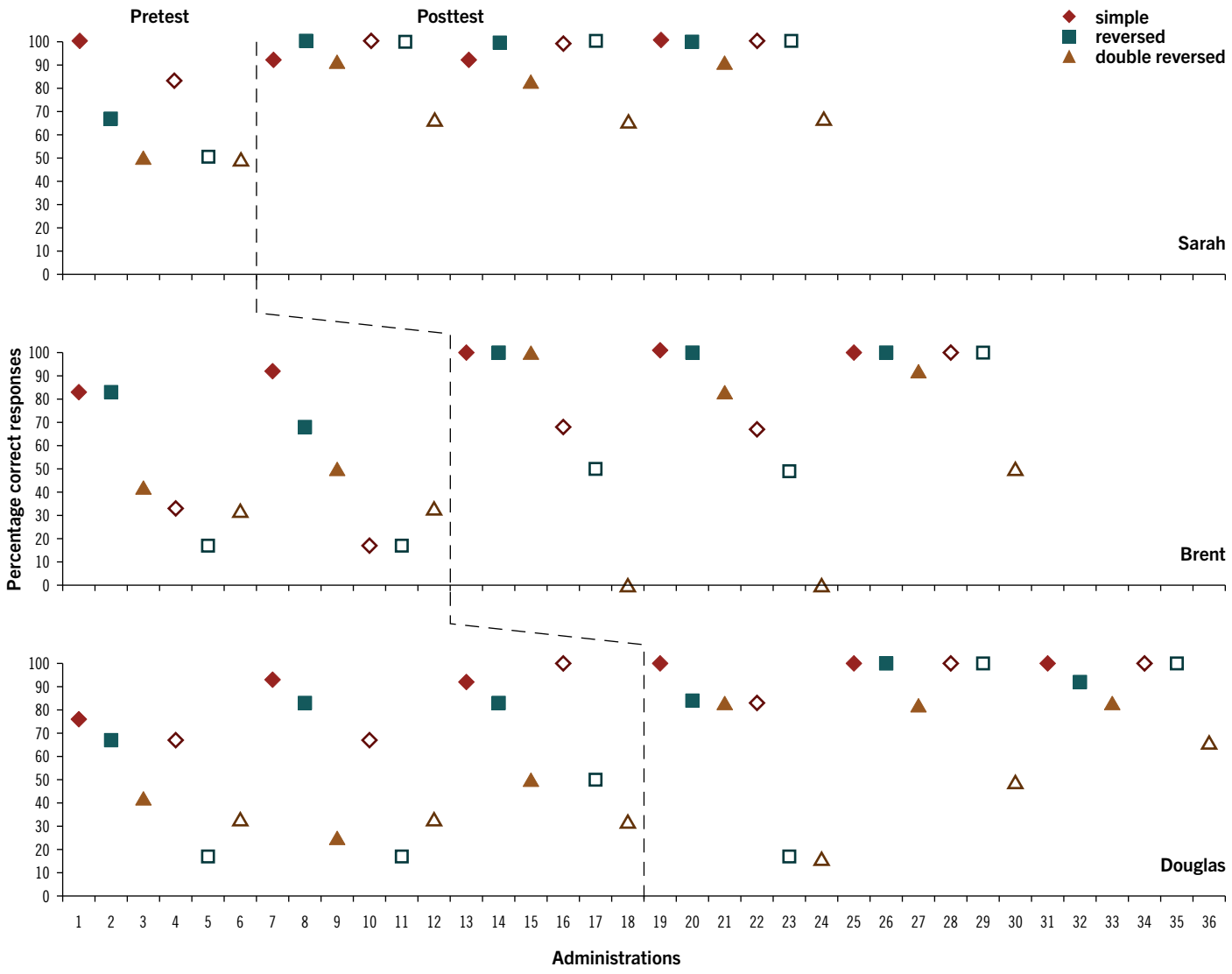


Figure 1. Percentage correct responses on pretest and posttest probes for simple, reversed, and double reversed relations. Solid data points indicate test probes and open data points indicate generalization probes.

equivalency, percentile rank, and standard score for performance on each subtest (Bowers, Huisingh, & LoGuidece, 2010).

Theory of Mind Inventory. The ToMI is a 48-item caregiver-report measure that evaluates caregiver's perceptions of the perspective-taking skills of adolescents with autism, including concepts such as false belief, visual perspective-taking, and irony. When responding, the caregiver makes a hash mark on an anchored scale, and the placement of the mark is later measured with a ruler to provide a score ranging between 0–20. Higher ratings on the scale represent a greater degree of ToM or perspective-taking skills (Lerner, Hutchins, & Prelock, 2010). The 48 items on this measure correspond to three different factors: Early, Basic, and Advanced ToM corresponding to the age a typical child masters the ToM skills (i.e., infancy or todderlhood, preschool, and middle to late childhood).

» RESULTS

Pretest probes

Results for test probes are depicted in Figure 1 as indicated by the solid data points. During each pretest probe session, simple, reversed, and double reversed relations were presented in a single trial block in a predetermined random sequence. Results for simple, reversed, and double reversed relations that were collected in a single probe session are presented as separate data points in Figure 1 in order to analyze responding at each level of complexity. Each succession of three closed data points was collected as part of a single test probe session and included simple, reversed, and double reversed relations as indicated by the closed diamonds, closed squares, and closed triangles, respectively. Participants were exposed to one probe session per day.

Table 1. Number of trial blocks to criterion during MEI for experiment 1

	Trial blocks to criterion			
Participant	Simple	Reversed	Double reversed	Mixed
Sarah	3	6	5	3
Brent	3	3	8	3
Douglas	3	4	4	3

Note. The minimum number of trial blocks required to meet the mastery criterion was three.

Table 2. Pretest and posttest results on the SLDT-A

	Pretest		Posttest	
Participant	Percentile rank	Standard score	Percentile rank	Standard score
Sarah	2	67	26	90
Brent	2	67	2	67
Douglas	2	67	17	86

Note. Standard scores are evaluated using a mean of 100 and a standard deviation of 15.

Results for each participant will be described individually, and participants will be identified using pseudonyms in order to protect their identities. Sarah responded with 100% accuracy on simple relations, 67% accuracy on reversed relations, and 50% accuracy on double reversed relations on one administration of the pretest probes. These data indicate that Sarah was responding above the 80% mastery criterion for simple relations at pretest, and she required instruction on reversed and double reversed relations.

Brent responded between 42–92% correct on two administrations of the pretest probes. The mean percentage correct across the two administrations of the probes was 87.5% for simple relations, 75% for reversed relations, and 46% for double reversed relations. These data indicate that Brent was responding above the mastery criterion for simple relations at pretest. Visual inspection of the graphical data shown in Figure 1 reveals that Brent responded at mastery criterion for the first administration of the reversed relations. Performance on reversed relations deteriorated during the second administration of the test probes, and Brent, therefore, required instruction on reversed as well as double reversed relations.

Douglas responded with between 25–92% accuracy on three administrations of the pretest probes. The mean percentage correct across the three administrations of the probes was 86.3% for simple relations, 77.7% for reversed relations, and 39% for double reversed relations. Visual inspection of the data presented in Figure 1 reveal that Douglas responded slightly below mastery criterion on simple and reversed relations during the first administration of the pretest probes. Performance on simple and reversed relations during subsequent pretest probes increased to meet the mastery criterion. Douglas required instruction only on double reversed relations.

Multiple exemplar instruction

As stated previously regardless of pretest probe performance, participants were exposed to instruction on all three levels of relational complexity. Instruction for simple, reversed, and double reversed relations was presented using separate blocks of trials for each level of complexity followed by a final block in which simple, reversed, and double reversed relations were randomized and presented in a single trial block. The criterion to infer mastery of the instructional relations was 3 trial blocks at 80% accuracy.

As shown in Table 1, Sarah met mastery criterion following 3 administrations of simple relations, 6 administrations of reversed relations, 5 administrations of double reversed relations, and 3 administrations of the mixed trial block including all three levels of complexity. Brent met mastery criterion following 3 administrations of simple relations, 3 administrations of reversed relations, 8 administrations of double reversed relations, and 3 administrations of the mixed trial block including all three levels of complexity. Douglas met mastery criterion following 3 administrations of simple relations, 4 administrations of reversed relations, 4 administrations of double reversed relations, and 3 administrations of the mixed trial block including all three levels of complexity. Multiple trial blocks were presented in a single session during instruction with an instructional session lasting no longer than 45 minutes. Criterion for all instructional relations was met for all three participants in three to four sessions.

Posttest probes

The criterion for inferring the emergence of deictic relational responding to novel relations was 80% accuracy on three consecutive probes. As shown in Figure 1, Sarah responded between 83–100% correctly on three administrations of the posttest probes. The mean percentage correct across the three administrations of the probes was 95% for simple relations, 100% for reversed relations, and 89% for double reversed relations.

Brent responded between 83–100% correctly on three administrations of the posttest probes. The mean percentage correct across the three administrations of the probes was 100% for simple relations, 100% for reversed relations, and 91.7% for double reversed relations.

Douglas responded between 83–100% correctly on three administrations of the posttest probes. The mean percentage correct across the three administrations of the probes was 100% for simple relations, 91.7% for reversed relations, and 83% for double reversed relations.

Generalization probes

Pretest generalization probes. Results for generalization probes are presented alongside pre and posttest probe data in Figure 1 as indicated by the open data points. Like the test probes, each succession of three generalization probes was collected during a single session, and the results for simple, reversed, and double reversed relations are presented separately for analysis. At pretest Sarah responded with 83% accuracy on simple relations, 50% accuracy on reversed relations, and 50% accuracy on double reversed relations for one administration of the generalization probe. These data indicate that Sarah was performing above the 80% mastery criterion on simple relations at pretest, but below mastery criterion on reversed and double reversed relations.

Table 3. Pretest and posttest results on the ToMI

	Pretest				Posttest			
Participant	**Early**	**Basic**	**Advanced**	**Overall**	**Early**	**Basic**	**Advanced**	**Overall**
Sarah	16.7	16	13.4	16.5	15.2	18.3	11.1	14.7
Brent	20	20	20	20	20	20	20	20
Douglas	17.1	15.3	16.2	16.9	13.1	14.3	12.4	13.5

Note. Scores on the ToMI range from 0-20 with higher scores indicating a greater degree of ToM. Early, basic, and advanced refer to three skill levels of ToM corresponding to infancy/toddlerhood, preschool, and middle/late childhood, respectively.

At pretest Brent responded between 17–33% correctly on two administrations of the generalization probes. The mean percentage accuracy across the two administrations of the generalization probes was 25% on simple relations, 17% accuracy on reversed relations, and 33% accuracy on double reversed relations. These data indicate that Brent was performing below mastery criterion on all three relational types at pretest.

At pretest Douglas responded between 17–100% correctly on three administrations of the generalization probes. The mean percentage accuracy across the three administrations of the generalization probes was 78% on simple relations, 84% accuracy on reversed relations, and 33% accuracy on double reversed relations. Visual inspection of the data presented in Figure 1 reveals that Douglas responded slightly below mastery criterion on simple relations for the first and second administrations of the generalization probe. Performance on simple relations during the final generalization probe increased to meet the mastery criterion. Performance on reversed and double reversed relations remained below mastery criterion for all three administrations of the generalization probes.

Posttest generalization probes. At posttest Sarah responded between 67–100% correctly on three administrations of the generalization probes. The mean percentage accuracy across the three administrations of the generalization probes was 100% accuracy on simple relations, 100% accuracy on reversed relations, and 67% accuracy on double reversed relations. These data indicate that Sarah was performing above the 80% mastery criterion on simple and reversed relations at posttest. Performance on double reversed relations slightly improved between pretest and posttest, but remained below mastery criterion for two administrations of the generalization probes. On the third administration of the generalization probes, the tact for each emotion the actors in the video were experiencing was orally presented to Sarah immediately following the video presentation. No change was observed in performance on the double reversed relations following the introduction of the tacts.

At posttest Brent responded between 0–100% correctly on three administrations of the generalization probes. The mean percentage accuracy across the three administrations of the generalization probes was 78% accuracy on simple relations, 66.7% accuracy on reversed relations, and 16.7% accuracy on double reversed relations. Visual inspection of the data presented in Figure 2 reveals modest improvements in performance on simple and reversed relations following MEI, but performance remained below mastery criterion on all three levels of relational complexity at posttest. On the third administration of the generalization probes, the tact for each emotion the actors in the video were experiencing was orally presented to Brent following the video presentation. With the addition of the tact, performance on simple and reversed relations increased to 100% accuracy meeting the mastery criterion. Performance on double reversed relations increased to 50% accuracy, but remained below mastery criterion.

At posttest Douglas responded between 17–100% correctly on three administrations of the generalization probes. The mean percentage accuracy across the three administrations of the generalization probes was 94.3% accuracy on simple relations, 72.3% accuracy on reversed relations, and 45.7% accuracy on double reversed relations. Visual inspection of the data presented in Figure 1 reveals that accurate responding to simple relations maintained following MEI, but performance on reversed and double reversed relations deteriorated at posttest. On the second and third administrations of the generalization probes, the tact for each emotion the actors in the video were experiencing was orally presented to Douglas following the video presentation. With the addition of the tact, performance on reversed relations increased to 100% accuracy meeting the mastery criterion. Performance on double reversed relations increased to 50% and subsequently 67% accuracy, but remained below mastery criterion.

SLDT-A

Pretest. Results for the SLDT-A are presented in Table 2. At pretest all three participants scored in the 2nd percentile indicating that 2% of children in the participants' age group score below this level. All three participants received a standard score of 67 at pretest indicating that all participants scored two standard deviations below the average of the peer group.

Posttest. At posttest Sarah's performance improved such that her score ranked in the 26th percentile, and her standard score increased to 90 within one standard deviation of the mean. Brent's score remained in the 2nd percentile at posttest, and his standard score remained at 67. Douglas' performance improved such that his score ranked in the 17th percentile, and his standard score increased to 86 within one standard deviation of the mean.

Anecdotal information. At pretest Sarah and Douglas were both observed to identify what each model in the test materials was thinking based on irrelevant stimulus features (e.g., if a man's face is oriented slightly upward and to the right, it means he's thinking deeply about something). Brent was unable to identify the complex emotion expressed in several of the test items.

At posttest Sarah was observed to imitate the gestures of the models in the photos before responding to each test item. Douglas was observed to respond in voices as though he were actually the model in the test item (e.g., identifying what a female model is thinking using a feminine voice). Brent remained unable to identify the majority of the emotions expressed in the test items.

ToMI

Pretest. Results for the TOMI are presented in Table 3. At pretest Sarah received an overall score of 16.5 on the TOMI with scores of 16.7, 16, and 13.4 on the Early, Basic, and Advanced ToM factors, respectively. Brent received an overall score of 20 with scores of 20 on each of the individual ToM factors as well. Douglas received an overall score of 16.9 on the TOMI with scores of 17.1, 15.3, and 16.2 on the Early, Basic, and Advanced ToM factors, respectively.

Posttest. At posttest Sarah received an overall score of 14.7 with scores of 15.2, 18.3, and 11.1 on the Early, Basic, and Advanced ToM factors, respectively. Brent again received an overall score of 20 with scores of 20 of each of the individual ToM factors. Douglas received an overall score of 13.5 with scores of 13.1, 14.3, and 12.4 on the Early, Basic, and Advanced ToM factors, respectively.

Summary of results

During pretest probes, all three participants performed with highest accuracy on simple relations, followed by reversed relations, and then double reversed relations. All three participants performed at mastery criterion on simple relations at pretest, and Douglas also performed at mastery criterion on reversed relations. Sarah and Brent required instruction on reversed and double reversed relations, while Douglas required instruction only on double reversed relations. During MEI participants mastered the instructional relations with 3 presentations of simple relations, 3–6 presentations of reversed relations, 4–8 presentations of double reversed relations, and 3 presentations of the full instructional protocol including all three levels of relational complexity. At posttest all three participants showed the emergence of deictic relational responding skills in the presence of novel relations for three administrations of the test protocol.

For generalization probes, Sarah and Douglas performed at mastery criterion on simple relations. All three participants performed below criterion on reversed and double reversed relations. Following MEI, Sarah's performance improved to meet criterion for simple and reversed relations, and increases were observed on double reversed relations. Brent and Douglas improved to mastery criterion on simple and reversed relations following introduction of the tact of each actor's emotion. Improvements on double reversed relations were observed for Brent and Douglas as well, but performance did not meet criterion.

Results of standardized assessments revealed that all three participants were scoring in the 2nd percentile with scores two standard deviations below the mean at pretest. At posttest Sarah and Douglas' standard scores increased to within one standard deviation of the mean. Results of the TOMI revealed that participants scored between 16.5–20 at pretest and 13.5–20 at posttest.

» DISCUSSION

Findings from the present investigation show MEI to be an effective instructional method for teaching young adults with Asperger syndrome to engage in deictic relational responding in the presence of novel relations. Testing and instruction of deictic relations was conducted using a protocol created for the developmental level of the participants, and following MEI, all participants attained criterion on posttest probes for all three levels of relational complexity. Regarding assessment of generalization following MEI, improvements in percentile rank and standard scores on the SLDT-A for Sarah and Douglas were observed at posttest, while little change was observed in ratings on the TOMI caregiver report measure from pretest to posttest. Findings from the present study also show varying degrees of generalization to a natural social interaction based on level of relational complexity. Following completion of MEI, Sarah's performance on generalization probes using video-based scenarios of social interactions increased to meet criterion for both simple and reversed relations. Performance for Brent and Douglas improved following introduction of the tact for each emotion experienced by the characters in the videos.

The majority of previous evaluations on the use of MEI to teach deictic relational responding skills have involved instruction of typically developing children using the McHugh et al. (2004) protocol (Weil et al., 2011) or a story-based protocol designed for young children (Davlin et al., 2011). Results of the current study lend support to use of the perspective-taking curriculum for individuals with autism created by McHugh et al. (2009) that outlines an instructional sequence for providing a history of MEI through teaching first simple, reversed, and finally double reversed relations. In contrast to previous research (e.g., Davlin et al., 2011; Weil et al., 2011), participants in the current study had a basic perspective-taking repertoire at pretest as evidenced by all three participants responding at mastery criterion on simple relations before instruction. According to the RFT analysis of perspective-taking, simple relations are the only level of relational complexity that does not require a relational response, and the participants respond directly to the question (Barnes-Holmes et al., 2004). For higher-functioning adolescents, correct responding to a direct question regarding characters in a scenario may be expected.

As stated previously, the perspective-taking protocol used in the current study evaluated three levels of relational complexity (i.e., simple, reversed, and double reversed) and three types of deictic relations (i.e., I-You, Here-There, and Now-Then) as in the McHugh et al. (2004) protocol. However, the structure of the I-You relations was designed differently in the current protocol. The I-You relations in the current protocol may better be described as You-Other You relations because the trials inquiring about perspective according to person included only the characters in the scenario. The perspectives of the actual participants (i.e., I) were not included in the relations. The You-Other You relation is aimed at an observational aspect of the perspective-taking repertoire. For example, an individual may observe two people interacting with one another before deciding to join the interaction. It is possible that an I-You

relation is necessary in order to successfully respond to a You-Other You relation because the participant must change perspective from I to You in order to then change perspective from You to Other You.

Another point of difference between the current protocol and the McHugh et al. (2004) protocol is the inclusion of an emotion component in trials. In an RFT analysis perspective-taking and empathy are viewed as two separate, albeit related, repertoires. Empathy involves a transformation of emotional functions that occurs according to the perspective of another individual, and perspective-taking skills are, therefore, a necessary component of an empathic repertoire (Valdivia-Salas, Luciano, Gutierrez-Martinez, & Visdomine, 2009). Although emotions were included in the scenarios in the present study, direct training promoting a transformation of functions was not attempted or evaluated. Based on the current results it cannot be determined if empathy followed from the instruction provided in the present study or if another component must be added to the intervention in order for this to occur. This would be a fruitful area of investigation for future research.

The current study also adds to the literature examining generalization of perspective-taking skills. The generalization probes in this study appear to require at least two different repertoires in order to achieve a correct response. The first repertoire involves deictic relational responding, and the second repertoire involves tacting emotions of other individuals. Results of the generalization probes suggest that these skills must *both* be taught in order for generalization to occur on this task. Evidence for this can be seen in an evaluation of Brent and Douglas' responding, as their performance on reversed relations increased following MEI only after tacts for the characters' emotions were introduced. This suggests a deficit in tacting emotions, rather than a deficit in relational responding, was the factor impacting Brent's initially low posttest scores. It may, therefore, be beneficial to teach both tacting of complex emotions as well as deictic relational responding in order to demonstrate meaningful generalization of skills to a more natural setting.

Results for performance on the SLDT-A can also be viewed as an assessment of generalization. Improvements in percentile rank and standard scores for Sarah and Douglas were observed at posttest. These results may reflect the findings of performance on the generalization probes because one of the main skills required to respond correctly on the SLDT-A is accurate tacting of a person's emotion. Anecdotal observations of Sarah and Douglas involving the imitation of the models' gesture and voices at posttest also suggest a stronger I-You relation following MEI. Results from the SLDT-A must, however, be interpreted with caution as this study spanned only a short time period of four to six weeks for all participants. It is possible that practice effects exerted influence on results on this assessment during the posttest administration.

A final aspect to consider in regards to generalization is performance on the TOMI. The lack of increase in scores on the TOMI are in contrast to previous research conducted by Weil et al. (2011) in which performance on TOM tasks designed for young children (e.g., false belief test) was shown to increase following MEI for deictic relations. Results of the current study may reflect a limitation of the TOMI measure. While the TOMI has been shown to be a reliable measure with time periods as short as four week intervening between administrations (Lerner et al., 2010), this measure has not been used to detect changes in TOM skills over such a short time period. Furthermore, as noted previously, participants in this study attended a boarding school, and academic advisors with whom they had daily contact were selected to complete the TOMI. The lack of a central caregiver in the boarding school environment likely decreased the probability of capturing changes in these skills across the course of the present study.

Continued research evaluating deictic responding would be beneficial in providing a knowledge base for teaching necessary social skills to individuals with Asperger syndrome. For example, when planning a shopping trip with a friend, an individual must respond according to I-You, Here-There, and Now-Then frames to plan a trip that will satisfy both that individual and the friend as well as account for both persons' schedules. Deictic relations are also needed when resolving conflicts by responding to an I-You relation in order to make a compromise that is acceptable to both parties. Better understanding of how to build the basis for complex social skills, such as those just mentioned, is needed in order to effectively teach those skills. This study provides the foundation for how to teach deictic responding to individuals with Asperger syndrome, which can serve as a starting point for teaching more complex interpersonal skills.

Limitations of the current study should be considered. Current results have been compared to previous work examining basic deictic frames. However, due to the inclusion of You-Other You relations in place of the traditional I-You relations, it is unclear how directly comparable these two frames related to the perspective of the speaker are. Future work evaluating the relationship between these relations is needed to clarify this issue. Another limitation involves the lack of a clear method for measuring the overt responses noted as anecdotal observations (i.e., the use of gestures or voices while completing the SLDT-A). These collateral responses may be important indicators of perspective-taking performance and deserve more direct attention in future research. Despite these limitations, the current study extends previous work and demonstrates the effectiveness of MEI to teach perspective-taking skills to young adults with Asperger syndrome. Perspective-taking instruction is an area rich with opportunities for future research, and quality instructional methods for teaching this skill are sorely needed in order to help those with deficits in this area. The current literature suggests that the RFT analysis of perspective-taking has the potential to provide the conceptual foundation needed to create effective instructional programs that promote generalization of skills, and continued examination of methods to promote generalization beyond the instructional environment would be a beneficial addition to the field. ■

REFERENCES

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

Barnes-Holmes, Y., McHugh , L., & Barnes -Holmes, D. (2004). Perspective taking and theory of mind: A relational frame account. *The Behavior Analyst Today, 5*, 15–25.

Bowers, L., Huisingh, R., & LoGuidice, C. (2010). Social Language Development Test Adolescent [Testing instrument]. East Moline, IL: LinguiSystems, Inc.

Davlin, N.L., Rehfeldt, R.A., & Lovett, S. (2011). A Relational Frame Theory approach to understanding perspective-taking using children's stories in typically developing children. *European Journal of Behavior Analysis, 12,* 403–430.

Downs, A., & Smith, T. (2004). Emotional understanding, cooperation, and social behavior in high-functioning children with autism. *Journal of Autism and Developmental Disorders, 34*, 625–635. doi: 0162–3257/04/1200–0625/0

Hayes, S.C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-Skinnerian account of human language and cognition*. New York, NY: Plenum.

Hayes, S.C., Fox, E., Gifford, E., Wilson, K., Barnes-Holmes, D., & Healy, O. (2001). Derived relational responding as learned behavior. In S.C. Hayes, D. Barnes-Holmes, & B. Roche (Eds.), *Relational frame theory: A post-Skinnerian account of human language and cognition* (pp. 21–49). New York, NY: Plenum.

Horner, R.D., & Baer, D.M. (1978). Multiple-probe technique: A variation on the multiple baseline. *Journal of Applied Behavior Analysis, 11,* 189–196. doi: 10.1901/jaba.1978.11–189

Howlin, P., Baron-Cohen, S., & Hadwin, J. (1999). *Teaching Children with Autism to Mind-Read: A Practical Guide.* Chichester, England: Wiley.

Lerner, M.D., Hutchins, T.L., & Prelock, P.A. (2010). Brief report: Preliminary evaluation of the Theory of Mind Inventory and its relationships to measures of social skills. *Journal of Autism and Developmental Disorders,41,* 512–517. doi: 10.1007/s10803–010–1066-z

LinguiSystems. (2011). Social Language Development Scenes Adolescent. East Moline, IL: LinguiSystems, Inc.

McHugh, L., Barnes-Holmes, Y., & Barnes-Holmes, D. (2004). Perspective-taking as relational responding: A developmental profile. *The Psychological Record, 54*, 115–145.

McHugh, L., Barnes-Holmes, Y., & Barnes-Holmes, D. (2009). Understanding and training perspective taking as relational responding. In R.A. Rehfeldt & Y. Barnes-Holmes (Eds.) *Derived relational responding applications for learners with autism and other developmental disabilities* (pp. 281–300). Oakland, CA: New Harbinger Publications.

Orsmond, G.I., Wyngaarden Krauss, M., Mailick Seltzer, M., (2004). Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of Autism and Developmental Disorders, 34,* 245–256. doi: 0162–3257/04/0600–0245/0

Twohig, M.P., Schoenberger, D., & Hayes, S.C. (2007). A preliminary investigation of Acceptance and Commitment Therapy as a treatment for marijuana dependence. *Journal of Applied Behavior Analysis, 40*, 617–632. doi: 10.1901/jaba.2007.619–632

Valdivia-Salas, S., Luciano, C., Gutierrez-Martinez, O., & Visdomine, C. (2009). Establishing empathy. In R.A. Rehfeldt & Y. Barnes-Holmes (Eds.) *Derived relational responding applications for learners with autism and other developmental disabilities* (pp. 301–311). Oakland, CA: New Harbinger Publications.

Vickerstaff, S., Heriot, S., Wong, M., Lopes, A., & Dossetor, D. (2007). Intellectual ability, self-perceived social competence, and depressive symptoms in children with high-functioning autistic spectrum disorders. *Journal of Autism and Developmental Disorders, 37,* 1647–1664. doi: 10.1007/s10803–006–0292-x

Weil, T.M., Hayes, S.C., & Capurro, P. (2011). Establishing a deictic relational repertoire in young children. *The Psychological Record, 61,* 371–390.

Yun Chin, H., & Bernard-Opitz, V. (2000). Teaching conversational skills to children with autism: Effect of the development of a theory of mind. *Journal of Autism and Developmental Disorders, 30,* 569–583. doi: 0162–3257/00/1200–0569$18.00/0

APPENDIX A

» SIMPLE RELATIONS

I-You

Ms. Foster is glad because she enjoys watching her students give presentations. Travis is nervous because he is reading a paper in front of class. Kelly is relieved because the teacher did not ask her to read her paper. Fred is worried because he doesn't want Ms. Foster to catch him with his phone in class.

How does Travis feel?
(*nervous*, relieved, glad, worried)

How does Kelly feel?
(*relieved*, nervous, glad, worried)

Vince is thirsty because he ate some cookies. Vince's sister is angry because Vince didn't leave her any cookies. Vince's dad feels rushed because he forgot to stop at the grocery store after work. Vince's mother is annoyed because Vince drank from the milk carton.

How does Vince feel?
(*thirsty*, annoyed, rushed, angry)

How does Vince's mother feel?
(*annoyed*, thirsty, rushed, angry)

Here-There

Eric is angry because here by his locker he cannot open his combination lock. There in the classroom Eric is thankful that Jennifer returned his lunch money. Jennifer is concerned because here in the hallway she found money on the floor. There in gym class Jennifer is embarrassed because she forgot to bring a change of clothes.

How does Eric feel there?
(*thankful*, angry, concerned, embarrassed)

How does Eric feel here?
(*angry*, thankful, concerned, embarrassed)

Ryan is worried because there at school he has not found a date to the dance. Here at the dance Ryan is pleased because he asked Peggy to go with him. Todd is anxious because there on the bus he was talking to Dolly. Here in the cafeteria Todd is excited because Dolly said she would go to the dance with him.

How does Ryan feel there?
(*worried*, pleased, anxious, excited)

How does Ryan feel here?
(*pleased*, worried, anxious, excited)

Now-Then

Before, Cassie was disappointed because she couldn't find a good book at the library. Now, Cassie is pleased because the librarian helped her find a good book. Yesterday, the librarian was upset because she lost her glasses. Now, the librarian is relieved because a friend found her glasses.

How does Cassie feel now?
(*pleased,* disappointed, upset, relieved)

How did Cassie feel then?
(*disappointed*, pleased, upset, relieved)

Yesterday, DeShawn was excited because he made a 3-point shot at basketball practice. Now, DeShawn is miserable because he fouled out at the basketball game. Yesterday, Carlos was confident because his team did great at basketball practice. Now, Carlos is disappointed because his team might lose the game.

How does DeShawn feel now?
(*excited*, miserable, confident, disappointed)

How did DeShawn feel then?
(*miserable,* excited, confident, disappointed)

» REVERSED RELATIONS

I-You

Ms. Foster is glad because she enjoys watching her students give presentations. Travis is nervous because he is reading a paper in front of class. Kelly is relieved because the teacher did not ask her to read her paper. Fred is worried because he doesn't want Ms. Foster to catch him with his phone in class.

If Travis were Kelly, how would Travis feel?
(*relieved*, nervous, glad, worried)

If Kelly were Travis, how would Kelly feel?
(*nervous*, relieved, glad, worried)

Vince is thirsty because he ate some cookies. Vince's sister is angry because Vince didn't leave her any cookies. Vince's dad feels rushed because he forgot to stop at the grocery store after work. Vince's mother is annoyed because Vince drank from the milk carton.

If Vince were his mother, how would Vince feel?
(*annoyed*, thirsty, rushed, angry)

If Vince's mother were Vince, how would Vince's mother feel?
(*thirsty*, annoyed, rushed, angry)

Here-There

Eric is angry because here by his locker he cannot open his combination lock. There in the classroom Eric is thankful that Jennifer returned his lunch money. Jennifer is concerned because here in the hallway she found money on the floor. There in gym class Jennifer is embarrassed because she forgot to bring a change of clothes.

If here were there, how would Eric feel here?
(*thankful*, angry, concerned, embarrassed)

If there were here, how would Eric feel there?
(*angry*, thankful, concerned, embarrassed)

Ryan is worried because there at school he has not found a date to the dance. Here at the dance Ryan is pleased because he asked Peggy to go with him. Todd is anxious because there on the bus he was talking to Dolly. Here in the cafeteria Todd is excited because Dolly said she would go to the dance with him.

If here were there, how would Ryan feel here?
(*worried*, pleased, anxious, excited)

If there were here, how would Ryan feel there?
(*pleased*, worried, anxious, excited)

Now-Then

Before, Cassie was disappointed because she couldn't find a good book at the library. Now, Cassie is pleased because the librarian helped her find a good book. Yesterday, the librarian was upset because she lost her glasses. Now, the librarian is relieved because a friend found her glasses.

If now were then, how would Cassie feel now?
(*disappointed*, pleased, upset, relieved)

If then were now, how would Cassie feel then?
(*pleased*, disappointed, upset, relieved)

Yesterday, DeShawn was excited because he made a 3-point shot at basketball practice. Now, DeShawn is miserable because he fouled out at the basketball game. Yesterday, Carlos was confident because his team did great at basketball practice. Now, Carlos is disappointed because his team might lose the game.

If now were then, how would DeShawn feel now?
(*excited*, miserable, confident, disappointed)

If then were now, how would DeShawn feel then?
(*miserable*, excited, confident, disappointed)

» DOUBLE REVERSED RELATIONS

I-You and Here-There

Eric is angry because here by his locker he cannot open his combination lock. There in the classroom Eric is thankful that Jennifer

returned his lunch money. Jennifer is concerned because here in the hallway she found money on the floor. There in gym class Jennifer is embarrassed because she forgot to bring a change of clothes.

If Eric were Jennifer and if here were there, how would Eric feel here?
(*embarrassed*, angry, thankful, concerned)

If Jennifer were Eric and if there were here, how would Jennifer feel there?
(*angry*, thankful, concerned, embarrassed)

Ryan is worried because there at school he has not found a date to the dance. Here at the dance Ryan is pleased because he asked Peggy to go with him. Todd is anxious because there on the bus he was talking to Dolly. Here in the cafeteria Todd is excited because Dolly said she would go to the dance with him.

If Ryan were Todd and if there were here, how would Ryan feel there?
(*excited*, worried, pleased, anxious)

If Todd were Ryan and if here were there, how would Todd feel here?
(*worried*, pleased, anxious, excited)

I-You and Now-Then

Now, Travis is nervous because he is reading a paper in front of class. Later, Travis will be excited because he is going to the arcade after school. Now, Kelly is relieved because the teacher did not ask her to read her paper. Later, Kelly will feel thirsty because she forgot her water bottle in her locker.

If Travis were Kelly and if now were then, how would Travis feel now?
(*thirsty*, nervous, excited, relieved)

If Kelly were Travis and if then were now, how would Kelly feel then?
(*nervous,* excited, relieved, thirsty)

Now, Vince is thirsty because he ate some cookies. Later, Vince will be upset because he was grounded for drinking from the milk carton. Now, Vince's mother is annoyed because Vince drank from the milk carton. Later, Vince's mother will be glad because she can watch her favorite show without hearing Vince's radio.

If Vince's mother were Vince and if now were then, how would Vince's mother feel now?
(*upset,* thirsty, annoyed, glad)

If Vince were his mother and if then were now, how would Vince feel then?
(*annoyed,* thirsty, upset, annoyed, glad)

Here-There and Now-Then

Yesterday, Cassie was disappointed because she couldn't find a good book there at the library, and Cassie was bored because she had nothing to read here at the park. Now, Cassie is elated because she won a free movie pass there at school, and Cassie is pleased because the librarian helped her find a good book here at the library.

If then were now and if here were there, how would Cassie feel here and then?
(*elated*, disappointed, bored, pleased)

If now were then and if there were here, how would Cassie feel there and now?
(*bored*, disappointed, elated, pleased)

Yesterday, DeShawn was excited because he made a 3-point shot there at basketball practice, and he was confident because here at home his dad told him he is a great player. Now, DeShawn is nervous because there at school Mary said she would come to his game, and DeShawn is miserable because he fouled out here at the basketball game.

If then were now and if there were here, how would DeShawn feel there and then?
(*miserable*, excited, confident, nervous)

If now were then and if here were there, how would DeShawn feel here and now?
(*excited*, confident, nervous, miserable)

APPENDIX B

» SIMPLE RELATIONS

I-You

Becky is sad because Jake said he doesn't want to be her boyfriend. Jake feels guilty because he hurt Becky's feelings. Alan is excited that Becky and Jake broke up because he likes Becky. Linda is worried that Alan will ask Becky to the dance instead of her.

How does Becky feel?
(*sad,* guilty, excited, worried)

How does Jake feel?
(*guilty,* sad, excited, worried)

Martin is annoyed because his Mom is texting him while he's at lunch with his friends. Jay is nervous because he had to sit with people he doesn't know at lunch. Lance is excited to meet a new person. Kelly feels giddy because she thinks Lance is smiling at her.

How does Jay feel?
(*nervous,* excited, disappointed, giddy)

How does Lance feel?
(*excited,* nervous, disappointed, giddy)

Here-There

Kim is shocked because here in the hallway her soda sprayed all over her dress. There in the classroom Kim is miserable because her dress is wet and sticky from the soda. Here in the hallway Juan is surprised because Kim opened her soda can after dropping it on the floor. Juan feels confused there in the classroom because he forgot to do his homework.

How does Kim feel here?
(*shocked,* miserable, surprised, confused)

How does Kim feel there?
(*miserable,* shocked, surprised, confused)

Danny is irritated because here in computer class he can't concentrate on his assignment. There on the bus Danny is confused because he can't find his wallet. Here in class Kyle is happy because he is playing a computer game. Kyle feels guilty there in the hallway because Danny said that he was upset with him for laughing too loud during class.

How does Danny feel here?
(*irritated,* confused, happy, guilty)

How does Danny feel there?
(*confused,* irritated, happy, guilty)

Now-Then

Yesterday, Clare's music teacher was concerned because her students were struggling with new music. Now, Clare's music teacher is relieved because her students learned a new song. Yesterday, Clare was frustrated because she couldn't play a song on her clarinet. Now, Clare is glad because her music teacher helped her play the new song on her clarinet.

How does Clare feel now?
(*glad,* frustrated, concerned, relieved)

How did Clare feel then?
(*frustrated,* glad, concerned, relieved)

Before, Chloe was happy because she found a cool music video online. Now, Chloe is shocked because her friend posted an embarrassing photo of her on Facebook. Before, Cindy was amused because she found a funny photo of Chloe. Now, Cindy feels bad because Chloe was offended by the photo she posted on Facebook.

How does Chloe feel now?
(*shocked,* happy, amused, bad)

How did Chloe feel then?
(*happy,* shocked, amused, bad)

» REVERSED RELATIONS

I-You

Becky is sad because Jake said he doesn't want to be her boyfriend. Jake feels guilty because he hurt Becky's feelings. Alan is excited that Becky and Jake broke up because he likes Becky. Linda is worried that Alan will ask Becky to the dance instead of her.

If Becky were Jake, how would Becky feel?
(*guilty,* sad, excited, worried)

If Jake were Becky, how would Jake feel?
(*sad,* guilty, excited, worried)

Martin is annoyed because his Mom is texting him while he's at lunch with his friends. Jay is nervous because he had to sit with people he doesn't know at lunch. Lance is excited to meet a new person. Kelly feels giddy because she thinks Lance is smiling at her.

If Jay were Lance, how would Jay feel?
(*excited,* nervous, disappointed, giddy)

If Lance were Jay, how would Lance feel?
(*nervous,* excited, disappointed, giddy)

Here-There

Kim is shocked because here in the hallway her soda sprayed all over her dress. There in the classroom Kim is miserable because her dress is wet and sticky from the soda. Here in the hallway Juan is surprised because Kim opened her soda can after dropping it on the floor. Juan feels confused there in the classroom because he forgot to do his homework.

If there were here, how would Kim feel there?
(*shocked,* miserable, surprised, confused)

If here were there, how would Kim feel here?
(*miserable,* shocked, surprised, confused)

Danny is irritated because here in computer class he can't concentrate on his assignment. There on the bus Danny is confused because he can't find his wallet. Here in class Kyle is happy because he is playing a computer game. Kyle feels guilty there in the hallway because Danny said that he was upset with him for laughing too loud during class.

If there were here, how would Danny feel there?
(*irritated,* confused, happy, guilty)

If here were there, how would Danny feel here?
(*confused,* irritated, happy, guilty)

Now-Then

Yesterday, Clare's music teacher was concerned because her students were struggling with new music. Now, Clare's music teacher is relieved because her students learned a new song. Yesterday, Clare was frustrated because she couldn't play a song on her clarinet. Now, Clare is glad because her music teacher helped her play the new song on her clarinet.

If then were now, how would Clare feel then?
(*glad,* frustrated, concerned, relieved)

If now were then, how would Clare feel now?
(*frustrated,* glad, concerned, relieved)

Before, Chloe was happy because she found a cool music video online. Now, Chloe is shocked because her friend posted an embarrassing photo of her on Facebook. Before, Cindy was amused because she found a funny photo of Chloe. Now, Cindy feels bad because Chloe was offended by the photo she posted on Facebook.

If then were now, how would Chloe feel then?
(*shocked,* happy, amused, bad)

If now were then, how would Chloe feel now?
(*happy,* shocked, amused, bad)

» DOUBLE REVERSED RELATIONS

I-You and Here-There

Danny is irritated because here in computer class he can't concentrate on his assignment. There on the bus Danny is confused because he can't find his wallet. Here in class Kyle is happy because he is playing a computer game. Kyle feels guilty there in the hallway because Danny said that he was upset with him for laughing too loud during class.

If Danny were Kyle and if there were here, how would Danny feel there?
(*happy,* irritated, confused, guilty)

If Kyle were Danny and if here were there, how would Kyle feel here?
(*confused,* irritated, happy, guilty)

Kim is shocked because here in the hallway her soda sprayed all over her dress. There in the classroom Kim is miserable because her dress is wet and sticky from the soda. Here in the hallway Juan is surprised because Kim opened her soda can after dropping it on the floor. Juan feels confused there in the classroom because he forgot to do his homework.

If Kim were Juan and here were there, how would Kim feel here?
(*confused,* shocked, miserable, surprised)

If Juan were Kim and there were here, how would Juan feel there?
(*shocked,* miserable, surprised, confused)

I-You and Now-Then

Earlier, Becky was happy because Jake said he would take her to the movies. Now, Becky is sad because Jake said he doesn't want to be her boyfriend. Earlier, Jake was frustrated because Becky texts him all the time. Now, Jake feels guilty because he hurt Becky's feelings.

If Jake were Becky and if now were then, how would Jake feel now?
(*happy,* sad, frustrated, guilty)

If Becky were Jake and if then were now, how would Becky feel then?
(*guilty,* happy, sad, frustrated)

Earlier, Jay was nervous because he had to sit with people he didn't know at lunch. Now, Jay feels comfortable because his new friend Lance is in his chemistry class. Earlier, Lance was excited to meet a new person. Now, Lance is glad because Jay agreed to do a group project with him in chemistry class.

If Jay were Lance and if now were then, how would Jay feel now?
(*excited,* nervous, comfortable, glad)

If Lance were Jay and if then were now, how would Lance feel then?
(*comfortable,* nervous, excited, glad)

Here-There and Now-Then

Yesterday, Clare was frustrated because there at home she couldn't play a song on her clarinet, and Clare was jealous because here at the mall her brother got new shoes. Now, Clare is glad because here at school her music teacher helped her play the new song on her clarinet, and Clare was disappointed because there at the state fair she missed watching the race.

If then were now and if here were there, how would Clare feel here and then?
(*glad,* frustrated, jealous, disappointed)

If now were then and if there were here, how would Clare feel there and now?
(*jealous,* frustrated, glad, disappointed)

Before, Chloe was happy because here at home she found a cool music video online, and Chloe was frustrated because there at the restaurant her favorite meal was not available. Now, Chloe is shocked because here at the library she found an embarrassing photo of herself on her friend's Facebook page, and Chloe was angry because there at school she forgot her homework.

If then were now and if there were here, how would Chloe feel there and then?
(*shocked,* happy, frustrated, angry)

If now were then and if here were there, how would Chloe feel here and now?
(*frustrated,* happy, shocked, angry)

APPENDIX C

Andy and Liz are walking into a building. Andy is walking sluggishly, carrying a basketball, and appears to be fatigued. Liz appears excited to see Andy and asks if he would like to go hang out in the common room. Later, Liz and Anna are sitting at the picnic table. Liz is talking on the phone and laughing loudly. Anna is reading a book and glaring at Liz with an annoyed expression.

Simple I-You:
How did Andy feel on the sidewalk? (tired)
How did Liz feel on the sidewalk? (excited)

Reversed I-You:
If Andy were Liz, how would Andy feel on the sidewalk? (excited)
If Liz were Andy, how would Liz feel on the sidewalk? (tired)

Double Reversed I-You/Here-There:

If Andy were Liz and if the sidewalk were the picnic table, how would Andy feel at the picnic table? (talkative)
If Anna were Liz and if the picnic table were the sidewalk, how would Anna feel on the sidewalk? (excited)

Anna and Lilith are sitting at a table having lunch. Anna is eating salad and has a disappointed facial expression, and Lilith is smiling and eating a bag of candy. Later in the afternoon, Anna and Lilith are sitting at a picnic table. Anna has a neutral or content facial expression and is eating potato chips, and Lilith has a pained expression and is grasping her stomach.

Simple Now-Then:

How does Anna feel in the afternoon? (content)
How did Lilith feel at lunch? (happy)

Reversed Now-Then:

If the afternoon were lunchtime, how would Anna feel in the afternoon? (disappointed)
If lunchtime were the afternoon, how would Lilith feel at lunchtime? (pained)

Double Reversed I-You/Now-Then:

If Anna were Lilith and if afternoon were lunchtime, how would Anna feel in the afternoon? (happy)
If Lilith were Anna and if lunchtime were the afternoon, how would Lilith feel at lunchtime? (content)

In the morning Lilith and Anna are sitting in class while the teacher is talking. Lilith is writing down notes and has an attentive facial expression, and Anna is looking at a magazine inside her book and smiling slyly. Later in the afternoon, the Lilith and Anna are seated at a table completing schoolwork. Lilith is fully concentrated on her schoolwork and confidently writing answers down. Anna has a frustrated facial expression and is flipping through the pages of her book as though she cannot find an answer.

Simple Here-There:

How did Lilith feel in the classroom? (attentive)
How does Anna feel at the study table? (confused)

Reversed Here-There:

If the classroom were the study table, how would Lilith feel in the classroom? (confident)
If the study table were the classroom, how would Anna feel at the study table? (sly)

Double Reversed Here-There/Now-Then:

If the study table were the classroom and if the morning were the afternoon, how would Lilith feel at the study table in the morning? (confident)
If the classroom were the study table and if the afternoon were the morning, how would Anna feel in the classroom in the afternoon? (sly)

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Facilitating repertoires of coordination, opposition distinction, and comparison in young children with autism

Sarah Dunne, Mairéad Foody*, Yvonne Barnes-Holmes, Dermot Barnes-Holmes, and Carol Murphy

Department of Psychology, National University of Ireland Maynooth

ABSTRACT

According to Relational Frame Theory (RFT), repertoires of derived relational responding are essential for the development of human verbal behavior. As a result, the implications of relational framing for the education of developmentally disabled populations may be immense. Although at the level of process, there appears to be little difference among specific relational frames, there is potentially a natural sequence to their emergence in typical development. However, there is very little published evidence of training children across multiple frames consecutively. The current research comprised four studies that explored an extended sequence of training and testing in the relational frames of coordination, opposition, distinction, and comparison in a sample of nine young children with autism. The results demonstrate the relative ease with which relational deficits in these areas were remediated. In addition, the relationship between outcomes on the Verbal Behavior Milestones and Placement Program-Assessment (VB-MAPP) and individual relational training requirements was investigated.

KEYWORDS: coordination, distinction, opposition, and comparative relations

Researchers working under the rubric of relational frame theory (RFT) have argued that derived relational responding is at the core of complex human verbal behavior, such as humor, story-telling, perspective-taking, and deception (e.g., Barnes-Holmes, McHugh, & Barnes Holmes, 2004; Hayes, Barnes-Holmes, & Roche, 2001). Specifically, RFT relies heavily on the concepts of arbitrarily applicable relational responding (AARR) and multiple stimulus relations (MSR) in its attempts to provide a contextual, functional, behavioral account of these complex cognitive skills. Indeed, these two concepts distinguish RFT from other behavioral accounts of stimulus relations (e.g., Sidman's equivalence, 1974) and have permitted exploration of areas not previously believed to be within the remit of behavior analysis.

» GENERATING REPERTOIRES OF AARR

For RFT, naming stimuli or events is at the heart of the development of verbal behavior. In naturalistic settings, there are many instances of naming behavior that are directly reinforced. For example, imagine that a parent holds up a child's favorite toy and says "Who's this?" If the child emits the correct name (e.g., "Teddy"), the parent will likely say "Well done". We might refer to this as an explicitly trained object-name relation. On another occasion, the parent may explicitly establish a reverse name-object relation. For example, imagine that the parent says "Where's Dolly?" and the child points to the correct toy (i.e., the doll), and again the parent says "Well done". Consider, however, a third type of interaction that may result from the two types illustrated above. Imagine, on this occasion, that the parent says "Where's Teddy?" and the child points to the teddy, even though this precise interaction (i.e., hear Teddy's name-point to Teddy) has never been explicitly reinforced. That is, the child may have experienced direct training with object-name relations involving the teddy and name-object relations involving the doll, but never name-object relations involving the teddy. For RFT, the child's novel but successful performance on the third type of interaction is an example of a derived mutually entailed name-object coordination relation, that is based upon the history of explicitly trained alternative object-name and name-object coordination relations, which is then applied to a novel name-object relation context (in this case with the teddy). In these cases, the novel or emergent behavior is truly derived (because it has no history of direct reinforcement), but is based upon a history of direct training with similar stimuli and relations. Of course, the concept of mutually entailed coordination relations is synonymous with the more traditional concept of symmetry, at least when coordination relations are involved. For RFT, natural language training involves an almost infinite number of trained and derived exemplars involving words and their related objects.

Mutually entailed relations, including coordination relations, can be readily trained in individuals in whom these repertoires are found to be absent or deficient. And according to RFT, multiple exemplar training (MET) is an effective tool for establishing these skills. In short, MET involves explicit testing and training in

* Corresponding Author: Mairéad Foody - Mairead.Foody@nuim.ie

exemplars of a target relational skill. Consider the experimental trials used by Barnes-Holmes, Barnes-Holmes, Roche, and Smeets (2001A) in their research with 16 children, aged 4–5 years old. Training comprised two simple action-object discriminations that involved selecting A1 (a car) in the presence of the experimenter waving (i.e., training wave-A1), and selecting A2 (a doll) in the presence of the experimenter clapping (clap-A2). These selections were reinforced to criterion. A subsequent test focused on the derived mutually entailed object-action relations (A1-wave and A2-clap). If the children failed the test, they received explicit object-action training on the same set (i.e., A1-wave and A2- clap) to criterion. This exemplar training continued across multiple stimulus sets until all children demonstrated derived mutually entailed relations on a novel set. Similar findings have been reported by Barnes-Holmes, Barnes-Holmes, Roche, and Smeets (2001B), and Gómez, López, Martín, Barnes-Holmes, and Barnes-Holmes (2007).

For RFT, of course, verbal behavior comprises much more than the derivation of mutually entailed coordination relations between objects and words. According to the theory, the derivation of combinatorially entailed relations is the next step up in complexity, but is still present very early on in natural language training. Consider the following example. Imagine that a parent holds up a child's favorite doll and asks "What is Jane"? If the child emits the correct name (e.g., "doll"), the parent will likely say "Well done". On another occasion, the parent may hold up the doll and ask "What is a doll?" If the child emits the correct name (e.g., "toy"), the parent will again likely say "Well done". Now imagine the parent asks the child "what is Jane?" and the child responds correctly with "toy". For RFT, the emergent relation between "toy" and "doll" is a derived combinatorially entailed coordination relation. As before, the child may have received explicit training for name-doll and doll-toy relations, but even without explicit training, a specific name-toy relation will be derived. This derived response, of course, is synonymous with the more traditional concept of transitivity. Several RFT studies have successfully used MET to facilitate other combinatorially entailed relations (e.g., opposite; Barnes-Holmes, Barnes-Holmes, & Smeets, 2004).

Coordination

The examples above all involved relations of coordination or equivalence. And coordination appears to be the most basic frame that infants come into contact with through natural language interactions, and may be the basis on which other frames are established (Lipkins, Hayes, & Hayes, 1993; Luciano, Gómez-Becerra, & Rodríguez-Valverde, 2007). This frame requires an individual to respond to contextual cues such as "is" ("is the same as", "equals", etc), which control the derivation of the coordination relations. In simple terms, "is", for example, specifies that two stimuli are arbitrarily coordinated. Consider experimental trials presented by O'Connor, Rafferty, Barnes-Holmes, and Barnes-Holmes (2009) who successfully employed MET to establish coordination relations in 15 children with ASD and three typically-developing children. Participants were trained to establish coordination relations among words, their related objects, and their related pictures, using nameable and familiar stimuli. Training AB relations established mutually entailed relations between the written words (A stimuli) and pointing to objects (B stimuli). This was followed by BC training (i.e., see objects, point to pictures). The combinatorial entailment (equivalence) tests involved the AC and CA relations (i.e., see word-point to picture; and see picture-point to word). The results demonstrated that MET successfully facilitated equivalence responding on a novel set with six out of eight children. In addition, the findings suggested a relationship between verbal ability and training requirements, such that participants with lower verbal ability required more exposures to explicit training of the target coordination relations. Several other studies have also explored coordination relations. For example, Barnes-Holmes, Barnes-Holmes, Smeets, and Luciano (2004) demonstrated the derived transfer of happy and sad mood functions through coordination relations in a sample of 16 adults. Carr, Wilkinson, Blackman, and McIlvane (2000) also established coordination responding in low-functioning individuals who showed deficits in these repertoires.

Opposition

The frame of opposition involves arbitrarily applying the relational cue "is the opposite of" or its equivalent along a specific dimension (e.g., hot *is the opposite of* cold). Consider research by Barnes-Holmes et al. (2004) who successfully employed MET to establish opposite relations in three typically-developing children. The basic experimental trial required the child to select the most valuable coin/s (from four possible options). Consider the following instruction: "Coin A buys many, and A is opposite to B, and B is opposite to C, and C is the opposite to D". Explicit training and increasingly complex testing (e.g., where the coins were presented randomly) continued until participants were responding to trials with 10-coin sequences. Several other studies have investigated this relational frame. For example, Dymond, Roche, Forsyth, Whelan, and Rhoden (2008) demonstrated the derived transfer of avoidance functions in accordance with opposite relations, while Whelan and Barnes-Holmes (2004) demonstrated the transfer of a punishing function.

Distinction

The relational frame of distinction involves responding to arbitrary differences among stimuli. Like opposition, distinction involves responding along a particular dimension by arbitrarily applying the relational cue "is different from" (e.g., men *are different from* women). Unlike opposition, however, distinction relations often do not specify the relevant dimension. For example, if you are told that 'men are different from women', it is unclear what these differences. Several RFT studies have investigated distinction relations. For example, Roche and Barnes (1996), and Steele and Hayes (1991) established responding in accordance with distinction relations in teenagers and adults.

Comparison

The comparative frame involves responding to one event in terms of a quantitative or qualitative relation along a specified dimension with another event. Comparative frames may be divided into specific sub-types, such as bigger-smaller, brighter-darker, etc. The different types are, in part, defined by the dimension along which the relation applies (e.g., size or speed). Comparative frames may

also involve quantification of the dimension (e.g., 'A is more than B and B is more than C'). Consider experimental trials presented by Barnes-Holmes, Barnes-Holmes, Smeets, Strand, and Friman (2004) who successfully employed MET to establish comparative relations in three typically-developing children. Training AB relations involved selecting the coin (from two possible options) that buy more sweets. Consider the following instruction: "Coin A buys less than coin B, so which coin would you take to buy as many sweets as possible"? Training BC relations was identical, but now compared coin B with a new coin C. Training ABC relations then involved all three coins. Consider the following instruction: "If coin A buys less than coin B, and if coin B buys less than coin C, which coin would you take to buy as many sweets as possible"? This was followed by an ABC test with novel stimuli. The results demonstrated that MET was a useful way to establish comparative relations and related generalization in young children. Berens and Hayes (2007) reported similar outcomes with typically-developing children.

Table 1. Age, VB-MAPP Level Scores and Assigned Level for All Participants

			VB-MAPP Outcomes				
P	Gender	Age Y/M	Total Score Level 1	Total Score Level 2	Total Score Level 3	Overall Score (Max=170)	Category Level
1	Male	4/6	42.5	25.5	1	69	2
2	Male	5/1	40	30	7	77	2
3	Male	4/9	27	0	0	27	1
4	Female	4/5	44.5	40	9	93.5	3
5	Female	4/11	34	10	0	44	1
6	Female	3/2	44.5	34	2	80.5	2
7	Male	4/0	39	16	0	55	2
8	Female	4/10	45	43	0	41	2
9	Male	5/0	41	56.5	42	139.5	3

» THE RELATIONAL SEQUENCE

Although at the level of process, there appears to be little difference between specific relational frames, there is potentially a natural sequence to their emergence in typical development. For example, opposition relations are most likely established, at least to some extent, after the emergence of coordination relations. This is because a coordination relation may be derived from opposition relations. For example, if A is *opposite* to B and B is *opposite* to C, then A and C are the *same*. To date, there appears to be no published research that has specifically addressed the optimal sequence for establishing relational frames, although this type of work may have significant educational implications. Indeed, RFT research has already demonstrated a link between derived relational responding and verbal ability as measured by intelligence tests (e.g., Gore, Barnes-Holmes, & Murphy, 2010; O'Hora, Pelaez, Barnes-Holmes, & Amesty, 2005; O'Toole & Barnes-Holmes, 2009). For instance, Cassidy, Roche, and Hayes (2011) successfully employed MET to establish a range of relational frames in young children, which subsequently correlated with improved performances on the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV). As a result of this, and the studies above that outline the establishment of broad repertoires of relational responding, Luciano et al. (2009) have argued that Applied Behavior Analysis (ABA) intervention programmes should incorporate training and testing in relational frames.

The current research was the first to explore the establishment of an extended sequence of training and testing in consecutive core relational frames in a sample of nine young children with a diagnosis of autism. Specifically, Study 1 sought to establish or facilitate coordination relations. Study 2 sought to establish/facilitate relations of opposition with four of the nine children from Study 1. Study 3 attempted to establish/facilitate distinction relations in two of the previous four children and Study 4 established/facilitated comparison relations in the same two participants. In addition, the putative relationship between training requirements for each relational frame and outcomes on the Verbal Behavior Milestones and Placement Program-Assessment (VB-MAPP; Sundberg, 2008) was investigated.

Study 1: establishing coordination relations

» METHOD

Participants

Nine children, all independently diagnosed with autism, participated in Study 1. There were six males and four females, all aged between 3 years/2months and 5 years/1 month. All participants were screened on the VB-MAPP. On this basis, their verbal behavior competence was categorized as follows: two children at Level 1 (lowest level), five at Level 2 (intermediate level), and two at Level 3 (highest level). The characteristics of all children are presented in Table 1.

Setting

All sessions were conducted in a small quiet classroom in each participant's respective preschool. Only the Researcher and the child were present in the room and were seated side-by-side at a small table. The maximum duration of a session was 20min., with no more than four sessions per week.

Materials

The current work involved cue cards for work commencement and ending, as well as reinforcers for correct responding during training and on-task behavior during testing. Study 1 involved 10 sets of picture stimuli, each with three members – one designated

Table 2. Examples of the namable and unnamable stimuli employed in study 1

Stimulus sets	A	B	C
Familiar set			
Unfamiliar set			

Table 3. Results of Testing and Training for Coordination Responding for Stages 1–2

	Stage 1: testing & training familiar stimuli						Stage 2: testing & training unfamiliar stimuli					
P	AB train.	AB test (20)	BC train.	BC test (20)	Symm. (40)	Equiv (40)	AB train.	AB test (20)	BC train.	BC test (20)	Symm. (40)	Equiv. (40)
1	80	20	118	20	40	21	79	20	80	20	40	39
	80*	20	79	20	40	39						
2	80	20	103	20	36	35	79	20	80	20	40	40
	80*	20	80	20	40	40						
3	80	20	77	20	31	–						
	80	20	78	19	40	30	78	19	80	20	38	39
	80	20	80	19	40	40						
4	117	20	120	19	40	40	80	20	80	20	40	40
5	140	16	78	20	31	–	192	18	111	20	27	–
	78	19	85	19	38	38	111*	20	80	20	40	39
6	79	19	94	20	32	–						
	92	18	78	20	23	–	76	19	80	20	40	40
	78	20	80	20	40	39						
7	140	20	129	19	28	–	79	28	86	20	38	40
	78	20	97	20	40	40						
8	96	19	77	20	40	40	79	20	79	20	40	40
9	80	20	80	20	40	40	80	20	80	20	40	39

Note. *Indicates the presentation of a novel set. – Indicates no test was provided

as stimulus A (e.g., A1), one designated as B (e.g., B1), and one designated as C (e.g., C1). Hence, each set comprised of a three-member class (e.g., A1-B1-C1). All of the stimuli that comprised Sets 1–6 were nameable and familiar pictures (e.g., picture of a car). In contrast, all of the stimuli in Sets 7–10 were unnameable and unfamiliar drawings (e.g., picture of the Greek symbol beta). One example of a familiar and unfamiliar stimulus set is illustrated in Table 2 (the full list of stimuli may be obtained from the authors).

Programmed consequences

A correct response consisted of a participant emitting a vocal response that corresponded to the correct answer of the question. When this occurred, the Researcher provided social praise and access to the specified reinforcer (e.g., "Yes that is correct, well done, here is a sweet"). An incorrect answer was defined as any vocal response that did not correspond to the correct answer or no response within 5s. of the start of a trial. Specific contingencies were always in place for on-task behavior (e.g., verbal praise such as "nice sitting"). This reinforcement always occurred after a delay of 30s. from the end of the previous test trial.

Procedure

Study 1 consisted of two stages with four phases each. Stage 1 was designed to test and train coordination relations using familiar stimuli. Phase 1 of Stage 1 involved training and testing AB relations and Phase 2 involved BC relations. Phase 3 involved a test of BA and CB relations, while Phase 4 involved a test of CA and AC relations. Stage 2 consisted of the same four phases with unfamiliar stimuli. If participants failed the test in any stage, they immediately proceeded to training. If participants had been trained on a particular set of stimuli, they completed testing on a novel set before proceeding to the next stage.

Stage 1: Familiar stimuli. *Phase 1: AB training and testing.* Phase 1 involved explicit training of the two target AB relations (e.g., A1-B1 and A2-B2) from each class. At the beginning of each trial, the sample A stimulus (e.g., A1) and two comparison stimuli (B1 and B2) were placed down side-by-side on the table. A correct response involved the participant pointing to, touching, or picking up the appropriate comparison (e.g., selecting B1 in the presence of A1). Training both AB trial-types was identical and each was presented in separate blocks of 10 trials, with the locations of the comparisons counterbalanced. Training commenced with A1-B1 and this continued until participants emitted 9/10 consecutively correct responses (90% accuracy). Training A2-B2 then began and continued until the same criterion was reached. Once criterion was reached on A2-B2, participants were presented with a test block of 40 mixed trials, 20 A1-B1 and 20 A2-B2.

Phase 2: BC training and testing. Participants who passed the AB test proceeded immediately to BC training and testing. This was identical to Phase 1, but involved BC relations (B1-C1 and B2-C2).

Phase 3: Testing BA and CB relations. Participants who passed the BC test proceeded immediately to mutual entailment (symmetry) testing in Phase 3. Each test comprised of 40 mixed trials: 10 B1-A1, 10 B2-A2, 10 C1-B1, and 10 C2-B2. The accuracy criterion was 90% per block. Participants who passed proceeded to the combinatorial entailment (equivalence) test in Phase 4. Alternatively, participants who failed repeated the conditional discrimination training in Phases 1 and 2, but with two novel stimulus sets (i.e., Sets 3 and 4; A3-B3 and A4-B4).

Phase 4: CA and AC equivalence testing. Phase 4 was identical to Phase 3, but involved a mixed 40-trial block of 10 C1-A1, 10 C2-A2, 10 A1-C1 and 10 A2-C2 trials. Participants who passed proceeded to Stage 2. Participants who failed returned to Phases 1 and 2, but again with two novel sets (e.g., Sets 5 and 6; A5-B5 and A6-B6).

Stage 2: Training and testing unfamiliar stimuli. Once participants demonstrated equivalence in Phase 4 of Stage 1, they were exposed to the same four phases again, but with unfamiliar stimuli.

» RESULTS

All nine children completed both stages, hence deriving combinatorially entailed relations with both the familiar and unfamiliar stimulus sets. However, the children differed somewhat in terms of the number of training trials and the number of exemplars needed to complete the phases. The number of training trials and exemplars per phase in each stage, as well as the test performances for each participant, are presented in Table 3.

The minimum number of training trials to meet criterion on the AB conditional discriminations in Stage 1 was 40. All children required between 79 and 140 trials (on the first two stimulus sets) before proceeding to the AB test, which all passed immediately. The minimum number of training trials to meet criterion on the BC conditional discriminations in Stage 1 was 40. All children again required 77–129 trials, and passed the BC test immediately. Three of the nine children (Ps 4, 8, and 9) passed the symmetry test immediately, and immediately passed the equivalence test. Two children (P1 and P2) passed the first symmetry test, but failed the equivalence test. They were reexposed to the conditional discrimination training (160 trials) on novel sets, passed the AB and BC tests, passed the second symmetry test, and passed the second equivalence test. Four children (Ps 3, 5, 6, and 7) failed the first symmetry test with accuracies from 28–32/40. The latter were then reexposed to the conditional discrimination training using two novel sets.

Three participants (Ps 3, 5, and 7) completed the conditional discrimination training in a total of 158–175 trials and passed the AB and BC tests immediately. They also passed the (second) symmetry test immediately and all except P3 also passed the subsequent equivalence test. Participant 3 was reexposed to the conditional discrimination training on the fifth and sixth sets (160 training trials). He passed both AB and BC tests, passed the third symmetry test, and passed the second equivalence test.

The remaining P6 required 170 trials to complete the second series of conditional discrimination training. Although she passed the AB and BC tests immediately, she again failed the second symmetry test (23/40). She required 158 trials to complete the third series of conditional discrimination training and passed the AB and BC tests immediately. She passed the (third) symmetry test and the subsequent equivalence test immediately.

All nine children completed the AB conditional discrimination training in Stage 2 in 78–192 trials, and all passed the AB test immediately. They required 77–111 training trials on the BC relations, and passed the BC test immediately. All (except P5) passed the symmetry and equivalence tests immediately. Participant 5 failed the first equivalence test and was reexposed to training on a novel set. She required 191 trials to complete the second set of conditional discrimination training and passed the symmetry and equivalence tests immediately.

The relationship between participants' VB-MAPP scores and the amount of conditional discrimination training required to reach criterion was explored using the Pearson product-moment correlation coefficient. There was a strong negative correlation between the two variables (r = -.525), with higher scores on the VB-MAPP associated with lower levels of training. However, due to the small sample size this did not reach statistical significance (p = .15).

Table 4. Example of the Big/Small Dimension Targeted in Study 2

Stimulus Dimension: Big/Small	
	

Study 2: establishing opposition relations

» METHOD

Participants, settings and materials

Four of the nine children from Study 1 participated in the current study (Ps 4, 5, 7, and 9). All aspects of the setting were identical to the previous study. In addition the study involved several pairs of, and individual, nameable and familiar colored picture stimuli. Specifically, Stage 1 involved 10 familiar colored picture stimuli (e.g., a dog), while Stages 2–4 primarily involved 10 alternative pairs of nameable and familiar stimuli (see Table 4 for examples). Each pair contained two pictures of the same item, which differed along one of ten physical dimensions. For example, one pair of pictures contained a large cow vs. a small cow, while another pair depicted a happy face vs. a sad face. The specific dimensions targeted were: big/small; long/short; wet/dry; hot/cold; happy/sad; clean/dirty; empty/full; dark/light; rough/smooth; and heavy/light. The procedure in Stages 2–4 primarily involved only 10 picture pairs (one per dimension), but additional pairs of pictures depicting the same dimension, but with different items, were available when necessary. Finally, the arbitrary opposition test in Stage 5 involved 8 pairs of identical pictures that were not used in the previous stages. The full list of stimuli may be obtained from the authors.

Procedure

The programmed consequences were identical to Study 1. Study 2 consisted of testing and training oppositional responding from the basic skill of YES/NO responding through to establishing arbitrary opposite relations across five stages. In all stages, if participants failed any of the tests they proceeded immediately to training on that set. If participants had been trained on a particular set of stimuli, the next testing phase always commenced with a novel set.

Stage 1: Testing YES/NO responding. Stage 1 comprised of a 30-trial test of YES/NO responding using the 10 familiar pictures (e.g., a cow, see Table 4). At the beginning of each trial, the Researcher held up one picture and asked "Is it a *(correct/incorrect name of item*?)" The first block of 10 trials all required YES responding (because the correct item in the picture was specified in the question).

Table 5. Results of Testing and Training Opposition Responding for Stages 1–5

P	Stage 1: YES/NO responding test (30)	Stage 2: identifying nonarbitrary dimensions testing/training (100)	Stage 3: opposite big/small test (20)	Stage 4: nonarbitrary opposite test (120)	Stage 5: arbitrary opposite test (80)
5	30	95 20T rough/smooth 100*	16 80T 20	114	72 240T big/small 76*
7	30	90 10T long/short 100*	10 40T 19	118	71
4	30	100	10 40T 20*	120	80
9	30	96 10T long/short 100*	20	120	80

Note. *Indicates testing on a novel set for the specified dimension

The second block of 10 trials all required NO responding (because an incorrect item was specified in the question). The third block of 10 trials was mixed randomly, with five YES trials and five NO trials. The mastery criterion was 27/30. When the children reached criterion they proceeded directly to the next stage.

Stage 2: Identifying nonarbitrary dimensions. Stage 2 involved the 10 pairs of pictures. At the beginning of each trial, one pair was placed side by side on the table and participants were asked, for example, "Show me the small one". In order to respond correctly, they were required to select the stimulus that matched the specified nonarbitrary dimension. Stage 2 always commenced with a 10-trial test block that targeted only the big/small dimension (i.e., 5 big trials and 5 small trials). The mastery criterion was 90% accuracy (9/10). Participants who achieved this proceeded immediately to a subsequent 10-trial test block targeting the second nonarbitrary dimension (i.e., long/short). Participants who failed the initial big/small test received explicit training on this dimension using the same set of pictures until they achieved 9/10 consecutively correct responses. They were then immediately exposed to a second big/small test involving a novel set of pictures. This pattern of testing and training each dimension continued until competence on all 10 nonarbitrary dimensions was demonstrated.

Stage 3: Testing and training opposite relations with big/small. Stage 3 involved the testing and training (if necessary) opposite relations using only the big/small dimension. The stage commenced with a 20-trial test block in which participants were required to select the opposite dimension in 10 trials (e.g., "Show me the *opposite* of the big one") and name the opposite dimension in the remaining 10 trials (e.g., Researcher pointed to the small stimulus and said "This one is small".) The mastery criterion was 18/20 and participants who passed proceeded to the next stage. Participants who failed received explicit training in blocks of 20 trials until they reached criterion on the same set of pictures. They were then reexposed to the test using a novel set of big/small pictures.

Stage 4: Testing and training nonarbitrary opposite relations. Stage 4 commenced with a combined test of Stages 1–3 involving all 10 dimensions. The test comprised of 120 mixed trials, with a 12-trial block for each dimension. Each 12-trial block comprised four questions from each of the three stages in a fixed sequence. Consider the example of rough vs. smooth. In the first four trials, the Researcher tested YES/NO responding (e.g., "Is this one rough? Is this one smooth?") In the next four trials, participants were required to abstract the nonarbitrary dimension (e.g., "Show me the smooth one"). The final four trials tested the opposite relations (e.g., "Show me the opposite of smooth"). The mastery criterion was 110/120 and participants who passed proceeded to the next stage.

Stage 5: Testing and training arbitrary opposite relations. Stage 5 was identical to Stage 4, except that all of the target relations were arbitrary. That is, although the 10 stimulus dimensions targeted above were referred to, the stimuli in question were actually physically identical. The test comprised 80 mixed trials, with an 8-trial block for each arbitrary dimension. Each 8-trial block comprised four questions each from Stages 2 and 3 in a fixed sequence. Consider again the example of rough vs. smooth. In the first four trials, participants were required to abstract the nonarbitrary dimension (e.g., the Researcher pointed to one stimulus and said "If this one is smooth, show me the smooth one"). The next four trials tested the opposite relations (e.g., "If this one is rough, show me the opposite of rough"). The mastery criterion was 7/8 correct responses. Participants who failed were exposed to explicit training to criterion and were then reexposed to the test involving 10 new stimulus sets, one for each dimension.

» RESULTS

All four children completed all five stages, but differed in the training needed to do so. The number of training trials and exemplars per stage and the test performances for each participant are presented in Table 5.

All four children passed the YES-NO test in Stage 1 with perfect performances. Only P4 correctly identified all nonarbitrary dimensions in the Stage 2 test, but failed the big/small test in Stage 3. She reached criterion in 40 training trials (2 blocks of 20) and passed the test with perfect responding on a new set. She then passed Stages 4 and 5 with perfect performances. Participant 9 failed on the long/short dimension in Stage 2 and reached criterion in the minimum 10 training trials. He then passed a second test block on long/short trials with a new set, and passed Stages 3, 4, and 5 with perfect responding.

Participant 5 failed on the rough/smooth dimension in Stage 2, reached criterion in 20 training trials, and then passed a second test block on rough/smooth trials with a new set. However, she then failed the test in Stage 3 and required 80 training trials to reach criterion (i.e., 4 blocks of 20). She then passed a second test on a novel set with perfect responding. This child reached criterion on the Stage 4 test, but failed the arbitrary opposition test on the big/small trials in Stage 5. She required 240 training trials (i.e., 30 blocks of 8) to reach criterion on this dimension before passing the test with a novel set. She then passed the test trials on all remaining dimensions.

Participant 7 failed on the long/short dimension in Stage 2, reached criterion in 10 training trials, and then passed a second test block on long/short trials with a new set. However, he then failed the test in Stage 3 and required 40 training trials to reach criterion. He then passed a second test on a novel set. This child then passed the tests in Stages 4 and 5.

The relationship between participants' VB-MAPP scores and the amount of conditional discrimination training required to reach criterion was explored using the Pearson product-moment correlation coefficient. There was a strong negative correlation between the two variables (r = -.683), with higher scores on the VB-MAPP associated with lower levels of training. However, due to the small sample size (N = 4), this did not reach statistical significance (p = .32).

Study 3: establishing distinction relations

» METHOD

Participants, setting, and materials

Two of the four children from Study 2 participated in the current study (Ps 4 and 9). All aspects of the setting were identical to the previous study. In addition, Stage 1 involved 10 pairs of matching colored picture stimuli (e.g., two pigs). Testing and training the abstraction of nonarbitrary dimensions in Stage 2 also involved four sets (2 pairs of each object in a set) of familiar objects (see Table 6 for an example). Each pair of objects was identical to one another, but differed from other pairs on one dimension: same/different colors; same/different length, same/different textures, and same/different shapes. Stage 3 also involved two sets (three objects per set) of identical cups and identical boxes.

Procedure

The programmed consequences were identical to the previous studies. Study 3 consisted of testing and training distinction responding from simply recognizing same and different pictures through to using this skill with nonarbitrary stimuli.

Stage 1: Testing nonarbitrary same/different relations. Stage 1 involved 30 test trials to assess responding to nonarbitrary same and different relations. At the beginning of each trial, the Researcher placed three picture cards (two identical pictures and one different) on the table and asked: "Show me the pictures that are the same/different". The first block of 10 trials required participants to select the two identical pictures, while the second block required the selection of the different picture. The third block of trials was randomly mixed, with five same trials and five different trials. The mastery criterion was 27/30.

Table 6. Example of the same/different shape dimension employed in study 3

Nonarbitrary stimulus sets (same/different shapes)


Stage 2: Testing nonarbitrary same/different relations across dimensions. Stage 2 comprised 32 test trials, with four blocks of eight trials for each of the four target stimulus dimensions (i.e., color, length, texture, and shape). During each block, either two stimuli that were identical on the target dimension (e.g., two red bricks) or that differed on the target dimension (e.g., a red brick and a yellow brick) were presented. Participants were asked, for example, "Are the bricks the same/different color?" The format was identical for assessing all four dimensions and the mastery criterion was 28/32.

Stage 3: Testing mutually entailed same/different relations. Stage 3 comprised a 12-trial test block, with six same trials and six different trials. During the same trials, the Researcher presented *two* identical stimuli and stated, for example, "Box A (pointing to one stimulus) is the same as Box B (pointing to the other stimulus)." During three of the trials, she then asked "Are they the same", while on the three remaining trials, she asked "Are they different?" During the different trials, the Researcher presented two non-identical stimuli and stated, for example, "Box A is different from Box B." Again, during three trials, she asked "Are they the same?" while on the three remaining trials, she asked "Are they different?" The mastery criterion was 100% because on half of the same trials and half of the different trials, correct responding may have been based on nonarbitrary, rather than arbitrary relations (e.g., when presented with identical stimuli and asked "Are they the same?").

Stage 4: Testing combinatorially entailed same/different relations. Stage 4 comprised a block of 12 test trials. On each trial, *three* identical objects (i.e., identical cups; labeled A1, B1, and C1) were placed side by side on the table. There were four trials for each of three trial types, referred to as: A same B, B same C, A same/different C; A same B, B different C, A same/different C; A different B, B same C, A same/different C. On two trials from each set of four, the question involved a same relation (e.g., A same C), whereas on the remaining two trials, the question involved a different relation (e.g., A different C). All trials assessed arbitrary responding to the

Table 7. Results of testing and training distinction responding for stages 1–4

P	Stage 1: same/different test (30)	Stage 2: nonarbitrary dimension test (32)	Stage 3: mutually entailed same/different test (12)	Stage 4: combinatorially entailed same/different test (12)
4	30	31	12	8 240T 11*
9	30	32	12	12

Note. *Indicates testing on a novel set

Table 8. Examples of stimulus sets employed in study 4

Stimulus type	Examples of stimulus sets
Nonarbitrary stimuli	
Arbitrary stimuli	

combinatorially entailed AC relation. The accuracy criterion was 11/12. If participants failed the test, they were exposed to explicit training of the target relations and then exposed to the same test with a novel set.

» RESULTS

Table 7 presents the test and training performances for each child across the four stages.

Participant 9 passed all tests and required no training at any stage. Participant 4 passed all tests, except Stage 4. Following extensive training (240 trials), she reached criterion and passed a subsequent test with novel stimuli. The relationship between participants' VB-MAPP scores and the amount of conditional discrimination training required to reach criterion was not explored because both participants were categorized at Level 3 on the VB-MAPP.

Table 9. Results of testing and training comparison responding for stages 1–4

P	Stage 1: nonarbitrary more-than/ less-than relations test (12)	Stage 2: nonarbitrary combinatorially entailed more-than/less-than test (24)	Stage 3: arbitrary more-than/ less-than test (24)	Stage 4: arbitrary combinatorially entailed more-than/less than test (24)
4	12	11 312T 24*	10 24T 23*	8 168T 18* 96 T 22*
9	12	15 168T 24*	24	23

Note. *Indicates testing on a novel set

Study 4: establishing comparative relations

» METHOD

Participants, setting, and materials

The same two children from Study 3 participated again. All aspects of the setting were identical to the previous study. In addition, Study 3 involved sets of identical objects and sets of non-identical coin-shaped objects (see Table 8).

Procedure

Stage 1: Testing nonarbitrary more-than/less-than relations. Stage 1 involved a fixed block of 12 test trials, first with six more-than relations and then six less-than relations. On each trial, an array of identical items was presented as *two* stimuli, with one always containing more items than the other (e.g., 10 candies on one side and 3 candies on the other). On the six more-than trials, the Researcher asked "Which has more" and a correct response involved pointing to the stimulus with the larger number of items. On the six less-than trials, the Researcher asked "Which has less" and a correct response involved pointing to the stimulus with the less number of items. The mastery criterion was 90%.

Stage 2: Testing nonarbitrary combinatorial more-than/less-than relations. Stage 2 involved a block of 24 test trials, with 12 trials for each of two trial types denoted as A < B < C and A > B > C, always involving an array of *three* sets of items. Similar to Stage 1, the three stimuli involved different numbers of items (e.g., 10 candies on one side, 5 candies in the middle, and 3 candies on the other side). On all trials, participants were asked about the combinatorially entailed AC relation (i.e. "Is A more than or less than C"). On the six A < B < C trials, a correct response involved deriving A < C, while on the six A > B > C trials, a correct response involved deriving A > C. The mastery criterion was 22/24. Participants who failed were exposed to explicit training of the target relations and were then tested on a novel set.

Stage 3: Testing arbitrary more-than/less-than relations. Stage 3 involved a fixed block of 24 test trials, with six trials for each of four trial types denoted as A > B; B < A; B > A; and A < B. On each trial, *two* identical items (referred to as 'coins') were presented. On three trials for each trial type, the Researcher asked "Which has more" and a correct response involved pointing to the stimulus which had been arbitrarily identified as worth more (e.g., selecting A when presented with A > B). On the other three trials for each trial type, the Researcher asked "Which has less" and a correct response involved pointing to the stimulus which had been arbitrarily identified as worth less (e.g., selecting B when presented with A > B). The mastery criterion was 90%. Participants who failed were exposed to explicit training of the target relations and were then tested on a novel set.

Stage 4: Testing arbitrary combinatorial more-than/less-than relations. Stage 4 involved a block of 24 test trials, with 12 trials for each of two trial types denoted as A < B < C and A > B > C, always involving an array of *three* sets of identical coins. On all trials, participants were asked about the combinatorially entailed AC relation (i.e., "Is A more than or less than C"). On the six A < B < C trials, a correct response involved deriving A < C, while on the six A > B > C trials, a correct response involved deriving

A > C. The mastery criterion was 90%. Participants who failed were exposed to explicit training of the target relations and were then tested on a novel set.

» RESULTS

The results for each participant according to each stage are presented in Table 9.

Participant 9 passed Stage 1 with a perfect score, but required 168 training trials to reach criterion. The child then passed the test using a novel set. He thereafter passed Stages 3 and 4 immediately (24/24 and 23/24, respectively). Participant 4 also passed Stage 1 with a perfect score, but similarly required 312 training trials to reach criterion before passing the test with a perfect score on a novel set. However, she also failed Stage 3 and needed 24 training trials (i.e., one block) before completing the test on the second exposure. This child also failed Stage 4 (8/24) and needed 168 training trials before reaching criterion. However, she also failed the second exposure to the test with the new set. She received an additional 96 training trials and finally passed the third test completing the test (22/24).

» DISCUSSION

The current set of four studies demonstrates the establishment or facilitation of derived relational responding in accordance with coordination, opposition, distinction, and comparative relations in a sample of nine children with autism.

Study 1 was designed to train coordination relations using familiar and unfamiliar stimuli. All nine children differed in terms of the amount of training they required to complete the symmetry and equivalence tests for coordination on the familiar stimuli. That is, three children (Ps 4, 8, and 9) passed both tests with training. Two children (Ps 5 and 7) failed the first symmetry test and required a modest amount of training (381–444) to pass the second symmetry test, but both then passed equivalence immediately. Two children (Ps 1 and 2) passed the first symmetry test but failed the first equivalence test, although they passed the second equivalence test after modest training (343–357 trials). One child (P6) failed two symmetry tests, required extensive training (501 trials) before passing the third test, and passed equivalence immediately. The remaining child (P3) failed the first symmetry test and required 315 trials before passing the second symmetry test. He subsequently failed equivalence and required 160 trials to pass the second equivalence test. After these patterns of testing and training, eight of the nine children (with the exception of P5) passed the symmetry and equivalence tests with the unfamiliar stimuli in Stage 2 without training.

There appeared to be some overlap between the children's VB-MAPP scores and their performances on the coordination relations. Specifically, those categorized at the highest Level 3 (i.e., Ps 4 and 9) required the least training with the familiar stimuli and no training on the unfamiliar stimuli. The five children categorized at the middle Level 2 (i.e., Ps 1, 2, 6, 7, and 8) generally required more (although highly variable amounts of) training with the familiar stimuli and no training on the unfamiliar stimuli. The two remaining children (Ps 3 and 5) categorized at Level 1 required the most training on familiar stimuli and one of these children (P5) also required training with unfamiliar stimuli. These findings support previous research which has shown a relationship between verbal ability and the training requirements and test performances for equivalence with coordination relations (e.g., Barnes, Browne, Smeets, & Roche, 1995; Barnes, McCullagh, & Keenan, 1990; Devany, Hayes, & Nelson, 1986; O'Connor et al., 2009).

All four children in Study 2 of opposition relations passed the YES-NO test without training. Only one child (P4) also passed the nonarbitrary dimensions test immediately, but she failed the big/small test and required 40 training trials before passing. She then passed the nonarbitrary and arbitrary opposition tests immediately. Two children (Ps 9 and 7) failed the nonarbitrary dimensions test with poor performances on the long/short dimension, and each passed after only 10 trials on that dimension. Subsequently, P9 passed the big/small test, and the nonarbitrary and arbitrary opposition tests without training. In contrast, P7 required 40 training trials to pass the big/small test, but he then passed both the nonarbitrary and arbitrary opposition tests without training. The remaining P5 failed the nonarbitrary dimensions test with a poor performance on the rough/smooth dimension, after which 20 training trials were required to pass on this dimension. However, she then required extensive training (80 trials) to pass the big/small test. Although she subsequently passed the nonarbitrary opposition test, she failed the arbitrary opposition test (again showing problems on the big/small trials). She required a total of 240 trials on this before passing the full test with a novel set.

Similar to Study 1, there appeared to be some overlap between the children's VB-MAPP scores and their performances on opposition relations as investigated in Study 2. Again, those categorized at the highest Level 3 (i.e., Ps 4 and 9) required the least training overall, and apart from 10 trials on the nonarbitrary dimensions test (P9), and 40 trials on the big/small test (P4), both children passed all tests without further training. One child categorized at the middle Level 2 (P7) required more training on the nonarbitrary dimensions test (on long/short) and on the big/small test, but was then also successful in passing the remaining tests. The remaining child (P5) was categorized at Level 1 and required the most training in order to pass the nonarbitrary dimensions test (rough/smooth), the big/small test and both opposition tests. Only one previous study has investigated the establishment of opposition relations (Barnes-Holmes et al., 2004), but the trials here differed considerably from that study and the latter did not include alternative scores of verbal ability. However, both studies were similar in that they established opposition responding in children who previously appeared to lack this repertoire.

Study 3 investigated distinction relations. Only two of the original children participated and both had been categorized at VB-MAPP Level 3, hence making it impossible to attempt to explore comparisons on verbal ability. Interestingly, however, some differences were recorded between the participants. One child (P9) passed all tests of distinction responding (i.e., the nonarbitrary same/different test, the nonarbitrary dimensions test, the mutually entailed same/different test, and the combinatorially entailed same/different test). Although P4 performed well overall, she required 240 training trials to pass the final combinatorially entailed test.

In short, P9 performed somewhat better than P4. To date, there appear to be no published studies of the establishment or facilitation of distinction relations in children.

The same two children participated in Study 4 in the investigation of comparative relations. Again there were considerable differences between the children's performances. Both passed the nonarbitrary more-than/less-than test with two comparisons, but required 168 (P9) or 312 (P4) trials to pass the same test with three comparisons (the combinatorially entailed test). Subsequently, P9 passed the arbitrary more-than/less-than tests with two and with three comparisons without additional training. In contrast, P4 required 24 training trials to pass the arbitrary two comparisons test and 168 trials to complete the arbitrary three comparisons test. She subsequently failed the second exposure to this test with a novel set. She received an additional 96 training trials and finally passed the third comparative test. Once again, therefore, P9 performed somewhat better than P4.

Although Ps 4 and 9 had both been categorized as Level 3 on the VB-MAPP, there were notable differences in their performances in Studies 3 and 4. Overall P9 required considerably less training. As a result, we returned to their original VB-MAPP outcomes and discovered that P9 had, in fact, a substantially higher score of 139.5 compared to P4's 93.5. This may, to some extent, account for the differences between training requirements of both children. These findings support previous research which has also shown a relationship between verbal ability and the training requirements and test performances with comparative relations (e.g., Gorham, Barnes-Holmes, Barnes-Holmes, & Berens, 2009).

It may be argued that the program of training and testing conducted across the four studies *facilitated* relational responding for some children, but *established* the target relational repertoires for others. For example, there were a number of areas in which P9 required no training and the training that was required always involved nonarbitrary relations, which thereafter ensured sound test performances on arbitrary relations. These findings suggest that the child had a broad array of existing relational skills that the training then fostered to facilitate the derived arbitrary performances. In contrast, several other children required explicit training on the arbitrary relations, which appeared to suggest that to some extent the target performances were being established (e.g., P4 required 264 training trials in total to pass the combinatorially entailed comparative test). What is perhaps more important about this is that the testing and training procedures permitted a very precise means of assessing each child's competencies on the target nonarbitrary and arbitrary relations, and training readily resulted in sound demonstrations of arbitrary responding with novel stimuli.

Barnes-Holmes et al. (2004) questioned the optimal training and testing sequence for the establishment of the core relational frames as targeted by the current research. And this raises the interesting (although perhaps simplistic) question about the manner in which these frames are established in the typical developmental trajectory. For example, Barnes-Holmes et al. asked, if the relational frame of sameness facilitates the frame of opposition, which seems likely to some extent because opposition relations incorporate same relations. It is difficult in the current research to address this issue because the sequence of studies was not a between-subjects design and only two children completed the latter two studies. Furthermore, of those two children, both had been assessed at VB-MAPP Level 3. However, the data from P4 does *not* appear to suggest that the training requirements of this child decreased steadily across the four studies, thus implying that the earlier frames did not greatly facilitate the subsequent frames. However, much more systematic explorations of this issue are needed.

The current research perhaps speaks as much to typical development as to atypical development, but at the very least demonstrates the way in which relational deficits may be tested and trained. None of the children found the procedures tiresome or aversive, and in all cases the target arbitrary performances were demonstrated on tests of novel stimuli in a matter of months. This suggests the feasibility of enhancing existing behavioral intervention programs with RFT testing and training protocols. It is possible, of course, that existing programs directly or indirectly target relational frames and facilitate same through existing training. However, there is no empirical evidence to indicate this and thus the relationship between these two system of intervention represents a potentially important vein of future research. ■

REFERENCES

Barnes-Holmes, Y., Barnes-Holmes, D., Roche, B., & Smeets, P. (2001a). Exemplar training and a derived transformation of function in accordance with symmetry: II. *The Psychological Record, 51,* 589–604.

Barnes-Holmes, Y., Barnes-Holmes, D., Roche, B., & Smeets, P. M. (2001b). Exemplar training and a derived transformation of function in accordance with symmetry: I. *The Psychological Record, 51,* 287–308.

Barnes-Holmes, Y., Barnes-Holmes, D., & Smeets, P. M. (2004). Establishing relational responding in accordance with opposite as generalized operant behaviour in young children. *International Journal of Psychology and Psychological Therapy, 4,* 559–586.

Barnes-Holmes, Y., Barnes-Holmes, D., Smeets, P. M., Strand, P., & Friman, P. (2004). Establishing relational responding in accordance with more-than and less-than as generalized operant behaviour in young children. *International Journal of Psychology and Psychological Therapy, 4,* 531–558.

Barnes-Holmes, Y., Barnes-Holmes, D., Smeets, P. M., & Luciano, C. (2004). The derived transfer of mood functions through equivalence relations. *The psychological Record, 54,* 96–114.

Barnes-Holmes, Y., McHugh, L., & Barnes-Holmes, D. (2004). Perspective-taking and Theory of Mind: A relational frame account. *The Behavior Analyst Today, 5,* 15–25.

Barnes, D., Browne, M., Smeets, P., & Roche, B. (1995). A transfer of functions and a conditional transfer of functions through equivalence relations in three to six year old children. *The Psychological Record, 45,* 405–430.

Barnes, D., McCullagh, P., & Keenan, M. (1990). Equivalence class formation in non-hearing impaired children and hearing impaired children. *Analysis of Verbal Behavior, 8,* 1–11.

Berens, N. M., & Hayes, S. C. (2007). Arbitrarily applicable comparative relations: Experimental evidence for relational operants. *Journal of Applied behaviour Analysis, 40,* 45–71.

Carr, D., Wilkinson, K. M., Blackman, D., & McIlvane, W. J. (2000) Equivalence classes in individuals with minimal verbal repertoires. *Journal of the Experimental Analysis of Behavior, 74,* 101–114.

Cassidy, S., Roche, B., & Hayes, S. C. (2011). A relational frame training intervention to raise Intelligence Quotients: A pilot study. *The Psychological Record, 61,* 173–198.

Devany, J. M., Hayes, S. C., & Nelson, R. O. (1986). Equivalence class formation in language-able and language-disabled children. *Journal of the Experimental Analysis of Behavior, 46*, 243–257.

Dymond, S., Roche, B., Forsyth, J. P., Whelan, R., & Rhoden, J. (2008). Derived avoidance learning: Transformation of avoidance response functions in accordance with same and opposite relational frames. *The Psychological Record, 58,* 269–286.

Gore, N. J., Barnes-Holmes, Y., & Murphy, G. (2010). The relationship between intellectual functioning and relational perspective-taking. *International Journal of Psychology and Psychological Therapy, 10* (1), 1–17.

Gorham, M., Barnes-Holmes, Y., Barnes-Holmes, D., & Berens, N. (2009). Derived comparative and transitive relations in young children with and without autism. *The Psychological Record, 59,* 221–246.

Gómez, S., López, F., Martín, C. B., Barnes-Holmes, Y., & Barnes-Holmes, D. (2007). Exemplar training and a derived transformation of functions in accordance with symmetry and equivalence. *Psychological Record, 57* (2), 273–294.

Hayes, S. C., Barnes-Holmes, D., & Roche, B. (Eds.). (2001). *Relational Frame Theory: A Post-Skinnerian account of human language and cognition.* New York: Plenum Press.

Lipkins, G., Hayes, S. C., & Hayes, L. J. (1993). Longitudinal study of derived stimulus relations in an infant. *Journal of the Experimental Analysis of Behavior, 56,* 201–239.

Luciano, C., Gómez-Becerra, I., & Rodríguez-Valverde, M. (2007). The role of multiple-exemplar training and naming in establishing derived equivalence in an infant. *Journal of Experimental Analysis of Behavior, 87,* 349–365.

Luciano, C., Berens, N. M., Rodríguez, M., Manas, I., Ruiz, F., & Valdivia-Salas, S. (2009). Acquiring the earliest relational operants: Coordination, Difference, Opposition, Comparison, and Hierarchy. In (Eds.) Y. Barnes-Holmes, & R. A. Rehfeldt, *Derived relational responding: Application for learners with autism and other developmental disabilities.* Oakland, CA: New Harbinger.

O'Connor, J., Rafferty, A., Barnes-Holmes, D., & Barnes-Holmes, Y. (2009). The role of verbal behavior, stimulus nameability and familiarity on the equivalence performances of autistic and normally developing children. *The Psychological Record, 59* (10), 53–74.

O'Hora, D., Pelaez, M., Barnes-Holmes, D., & Amesty, L. (2005). Derived relational responding and human language: Evidence from the WAIS-III. *The Psychological Record, 58*, 155–174.

O'Toole, C., & Barnes-Holmes, D. (2009). Three chronometric indices of relational responding as predictors of performance on a brief intelligence test: The importance of relational flexibility. *The Psychological Record, 59*, 119–132.

Roche, B., & Barnes, D. (1996). Arbitrarily applicable relational responding and human sexual categorization: A critical test of the derived difference relation. *The Psychological Record, 46,* 451–475.

Sidman, M. (1974). *Equivalence relations and behaviour: A research story.* Boston, MA: Authors Cooperative.

Steele, D. L., & Hayes, S. C. (1991). Stimulus equivalence and arbitrarily applicable relational responding. *Journal of the Experimental Analysis of Behavior, 55,* 519–555.

Sundberg, M. L. (2008). *VB-MAPP Verbal behaviour milestones assessment and placement program: A language and social skills assessment program for children with autism or other developmental disabilities.* Concord, CA: AVB Press.

Whelan, R., & Barnes-Holmes, D. (2004). The transformation of consequential functions in accordance with the relational frames of same and opposite. *Journal of the Experimental Analysis of Behavior, 82,* 177–195.

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Using the implicit relational assessment procedure (IRAP) to assess implicit gender bias and self-esteem in typically-developing children and children with ADHD and with dyslexia

Geraldine Scanlon[1], Ciara McEnteggart[2], Yvonne Barnes-Holmes[2], Dermot Barnes-Holmes[2]

1 Dublin City University
2 National University of Ireland Maynooth

ABSTRACT

The current research comprised two studies that explored the utility of the Implicit Relational Assessment Procedure (IRAP) as a measure of children's implicit attitudes to the self. Study 1 (N = 20) involved a sample of children with ADHD and typically-developing children, all aged between 8 and 11 years. Across IRAP trials, each child's own name (e.g., MARY) was juxtaposed with a common name of the opposite gender (e.g., PETER), and presented in conjunction with three positive or three negative words and the two relational terms SIMILAR and OPPOSITE. The results indicated that both groups of children showed an implicit pro-self bias in trial-types denoted as Self-Positive and Self-Negative. While the typically-developing children were neither positive nor negative towards the other gender, the children with ADHD showed a pro-other bias in the Other-Negative trial-type. Study 2 (N = 20) involved typically-developing children and children with dyslexia, all aged between 9 and 14 years. Again, both groups showed a pro-self bias in the Self-Positive and Self-Negative trial-types, and both were neither positive nor negative in the Other-Positive trial-type. However, the typically-developing children were anti-others in the Other-Negative trial-type, while the children with dyslexia were pro-others. The study highlights the benefits of using both explicit and implicit measures, especially the IRAP, when assessing the implicit cognitions of children.

KEYWORDS: implicit relational assessment procedure, implicit attitudes, self-esteem, ADHD, dyslexia

» IMPLICIT MEASURES

Traditional methods of psychological assessment have relied heavily on direct self-report measures in which participants have the opportunity to carefully choose and deliberate their responses (hence the term *explicit attitudes*; see Greenwald & Banaji, 1995; Nosek, 2007). It is not surprising, therefore, that difficulties in accurate measurement, such as self-presentational biases, are commonly reported (e.g., de Jong, 2002; Teachman, Gregg, & Woody, 2001). Furthermore, cognitive researchers have recently argued that attitudes are guided, at least in part, by cognitive processes of which we are often not aware (Steele & Morawski, 2002), hence further limiting their potential use. In response to these difficulties, social psychologists have developed *indirect* measures that appear to capture what are called *implicit attitudes*. While these methodologies and the implicit attitudes they assess do not yield to introspection, they are nonetheless believed to impact upon behavior (Wiers, Teachman, & De Houwer, 2007). There are already a number of methodologies that measure the strength of implicit attitudes, including: the Implicit Association Test (IAT); the Go/No-go Association Task; the Extrinsic Affective Simon Task; and the Implicit Relational Assessment Procedure (IRAP). The Implicit Association Test (IAT) is by far the most commonly known and widely used implicit methodology with over 250 published studies of its use (Greenwald, McGhee, & Schwartz, 1998). The rationale of the IAT is that it should be easier to combine two concepts into a single response if they are associated in memory than if they are not. The IAT effect has repeatedly shown implicit attitudes and dysfunctional beliefs in a host of published studies across multiple domains (e.g., de Jong, 2002; de Jong, Pasman, Kindt, & van den Hout, 2001; Gemar, Segal, Segratti, & Kennedy, 2001; Teachman et al., 2001).

While the IAT emerged from mainstream social psychology and the associative learning tradition, it has captured the interest of behavioral researchers. However, unlike the former, the latter have argued that implicit attitudes are *relational* in nature, not merely associative. This perspective has been specifically advocated by researchers working in Relational Frame Theory (RFT), who have recently developed their own implicit measure, known as the Im-

Correspondence concerning this article should be addressed to Yvonne Barnes-Holmes, Department of Psychology, National University of Ireland Maynooth, Maynooth, Co. Kildare. Contact: Yvonne.Barnes-Holmes@nuim.ie

plicit Relational Assessment Procedure (IRAP; Barnes-Holmes et al., 2006). In behavioral terms, the IRAP requires participants to respond quickly and accurately to stimuli deemed both consistent and inconsistent with their pre-experimentally established verbal relations. The IRAP effect is said to occur when the average latencies of responding to consistent beliefs are faster than to inconsistent beliefs. Indeed, what makes the IRAP more precise than any other indirect measure is its ability to focus on specific stimulus relations (e.g., coordination, hierarchy, spatial, temporal, and comparative) and even propositions concerning the self (e.g., deictic relations) with varying levels of relational complexity. As a result, the measure may well facilitate the study of more complex psychological phenomena than the IAT (see Hughes, Barnes-Holmes, & Vahey, 2012, for an extended account).

The IRAP is also distinct in format from the IAT in that it does not involve an increasingly complex set of tasks presented across blocks, instead all IRAP blocks are identical in form. This latter feature, in particular, suggests its potential utility with children. Consider a standard IRAP trial in which participants are required to match the sample word PLEASANT or UNPLEASANT with a positive or negative target word (e.g., HOLIDAY or CANCER) using the relational response options SIMILAR or OPPOSITE. Trial blocks are only differentiated in terms of whether the correct response is deemed to be consistent with established participant attitudes (e.g., PLEASANT-HOLIDAY-SIMILAR) or inconsistent (e.g., UNPLEASANT-CANCER-OPPOSITE). In short, it is assumed experimentally that most participants come into an experiment with an established verbal history in which the words HOLIDAY and PLEASANT are coordinated or similar in the sense that both are positively evaluated. In this case, the relationship between PLEASANT and HOLIDAY is deemed to be consistent when their combination is responded to by selecting SIMILAR. Alternatively, the relationship between PLEASANT and HOLIDAY is deemed to be inconsistent when their combination is responded to by selecting OPPOSITE. Similarly, for most participants the words CANCER and UNPLEASANT are coordinated or similar in the sense that both are negatively evaluated. In this case, the relationship between UNPLEASANT and CANCER is deemed to be consistent when their combination is responded to by selecting SIMILAR. Alternatively, the relationship between UNPLEASANT and CANCER is deemed to be inconsistent when their combination is responded to by selecting OPPOSITE. Researchers have reported strong and predicted IRAP effects across a growing array of clinical and social domains in adult samples, while also showing predictive validity in several clinically relevant behaviors (see Hughes et al., 2012).

While there are hundreds of published studies on the implicit attitudes of adults, similar research on children is very limited. Skowronski and Lawrence (2001) were among the first to use the Implicit Association Test (IAT) with children to study gender stereotyping in typically-developing 11 year olds. Although the data did not show the expected implicit bias towards the children's own gender nor against the opposite gender, the researchers reported no procedural difficulties in using the IAT with such a young sample. In contrast, considerable difficulties were subsequently reported by Rutland, Cameron, Milne and McGeorge (2005) when presenting the IAT to 6 to 7 year olds. In response, the researchers developed a pictorially-based IAT, in which the attribute words were replaced with cartoon faces (e.g., PLEASANT and UNPLEASANT were replaced with happy and sad cartoons, respectively). In addition, the more conventional keyboard press responses were replaced with moving the computer mouse either towards or away from the screen. The authors found that from an early age children showed implicit intergroup bias and reported positive benefits of using the modified IAT.

The IAT was further modified, referred to as the *Ch-IAT,* by Baron and Banaji (2006) who replaced the attribute words with audio recordings in an attempt to control for reading level variability. The response options were changed again to simple button presses (e.g., one for GOOD, another for BAD). These procedural adjustments appear to have been more effective as the data showed that the sample of Caucasian American 6–10 year olds displayed the expected pro-white and anti-black biases. Similar and expected outcomes were also reported by Dunham, Baron, and Banaji (2006), who used the same modified procedure to show a pro-white bias with a sample of Caucasian American and Japanese 6 and 10 year olds.

» THE CURRENT RESEARCH

Due to the small body of IAT research with children and the absence of any published IRAP studies with children, the current work represents the first attempt to employ the IRAP with a young sample. The primary aim of the current research sought to explore the utility of the IRAP with groups of children who were not typically-developing, and who might therefore experience challenges navigating the procedure, not experienced by their typically-developing counterparts. Specifically, we included children with Attention Deficit Hyperactivity Disorder (ADHD) who may present with attentional challenges, as well as children with dyslexia, who may present with reading challenges. Overall, our aim with all three groups of children was primarily to explore the procedural utility of the IRAP with young people.

In order to demonstrate this, we conducted two studies which investigated the children's implicit attitudes to the self vs. the opposite gender. Gender was depicted through common names (e.g., PETER for boys and LOLA for girls) which were juxtaposed against the name of each participant. We chose to investigate gender bias specifically with the young samples because a wealth of developmental literature indicates that gender biases in terms of pro-self and anti-others are well established in elementary school children (Eagly & Mladinic, 1989; Ebert & Steffens, 2008). Indeed, Cvencek, Greenwald and Meltzoff (2011) found implicit gender biases in children as young as four years. Hence, we chose children at least of this age. Numerous IAT studies have also examined gender bias in adults (Rudman & Goodwin, 2004) and Vahey, Barnes-Holmes, Barnes-Holmes and Stewart (2009) found strong pro-self biases in adults using the IRAP. However, it is important to note that the current research was not designed to demonstrate potential differences between the groups of children, but rather to investigate the utility of the IRAP with young children and children with specific challenges. Should any unsuspected differences emerge between the groups of children, further research would be required to investigate this.

Table 1. Stimulus arrangements employed in study 1

Sample 1	Sample 2
(Participant's) OWN NAME	(Opposite gender name) PETER/LOLA
Response option 1	**Response option 2**
SIMILAR	OPPOSITE
Targets deemed consistent with sample 1	**Targets deemed consistent with sample 2**
ACCEPTED	FAULTY
POPULAR	BROKEN
PERFECT	USELESS

Study 1

The primary aim of Study 1 was to examine the utility of the IRAP in measuring implicit gender bias in children with and without ADHD. While the former group of children were selected based on the possibility that they may present with attentional challenges during the IRAP, they also offered us the opportunity to begin to address the on-going controversy over self-esteem in this population (e.g., Selikowitz, 2004). That is, while the majority of studies suggest that self-esteem in this population is lower than average (e.g., Barber, Grubbs, & Cottrell, 2005; Biederman, 2005; Edbom, Lichtenstein, Granlund, & Larsson, 2006; Ek, Westerlund, Holmberg, & Fernell, 2008; Treuting & Hinshaw 2001), several studies appear to show self-esteem within the normal to above-average range (e.g., Gresham, MacMillan, Bocian, Ward, & Forness, 1998; Hoza, Pelham, Milich, Pillow, & McBride, 1993; Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Hoza et al., 2004; Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007; Stewart & Buggy, 1994). Study 1 also examined potential correlations between the IRAP as an implicit measure and the Piers-Harris Children's Self-Concept Scale-2 (PH2) as an explicit measure.

» METHOD

Participants

Twenty children were recruited through direct contact with elementary and post-elementary schools in Ireland, and written parental and participant consent were obtained in all cases. The children ranged in age from 8 to 11 years (M = 9 years, 11 months). The 10 typically-developing children (6 females and 4 males) had all been categorised by independently educational assessment as within the "normal" range of intellectual functioning, with no prior history of behavioral or learning difficulties. The 10 children with ADHD (2 females and 8 males) all had an independent diagnosis of ADHD, but were categorized as within the "normal" range of intellectual functioning.

Setting

All aspects of the study were conducted in a quiet room in each participant's school, with the Researcher and a familiar Special Needs Assistant (SNA) present at all times. All participation was on an individual basis.

Apparatus and materials

The study simply involved the presentation of the Piers-Harris Children's Self-Concept Scale 2 (PH2) and an implicit measure (the IRAP).

PH2. The PH2 is a self-report instrument for the assessment of self-concept in children (Piers & Herzberg, 2003). The measure comprises a 60-item questionnaire with a scoring range of 0–69. It is sub-divided into six self-concept subscales: Behavioral Adjustment (14 items); Intellectual and School Status (16 items); Physical Appearance and Attributes (11 items); Freedom from Anxiety (14 items); Popularity (12 items); and Happiness and Satisfaction (10 items). Responding simply involves circling YES or NO in terms of whether each statement applies to the respondent. Answers are converted to an overall standardised T-score. A higher T-score indicates higher self-concept and a lower score indicates lower self-concept (i.e., 30–44 = LOW; 45–59 = AVERAGE; and 60–69 = HIGH).

The Implicit Relational Assessment Procedure (IRAP). The IRAP software may be downloaded from http://irapresearch.org/downloads-and-training/. The "self" was represented in the sample stimulus by each child's name and the category of "others" was represented by a person with a name from the opposite gender. For example, if the participant was a young boy called Martin, the samples were MARTIN (self) and LOLA (girl's name), but if the participant was a girl called Mary, the samples were MARY and PETER (boy's name) (capital letters denote actual stimuli). In all cases, LOLA and PETER were used as names of the opposite gender. The target stimuli contained six evaluative terms, three positive (ACCEPTED, POPULAR, and PERFECT) and three negative (FAULTY, BROKEN, and USELESS). The response options comprised the words SIMILAR and OPPOSITE and were represented by the letters 'd' and 'k' on the keyboard. The stimulus arrangements for the IRAP are presented in Table 1. A series of flash cards depicting screen shots of IRAP trials were employed to familiarize the children with the procedure (see below).

Procedure

All participants completed the study in a single session that lasted between 30 and 40 minutes. Although made available to them throughout the session, none of the children opted for a short break. All participants were presented with the same experimental sequence that involved exposure to the PH2 followed after a short break by the IRAP.

PH2. At the beginning of the study, participants were provided with extensive verbal instructions regarding completion of the PH2, but no influence was exerted on any responses. The Researcher remained seated beside each participant throughout all aspects of the questionnaire.

The IRAP. The first set of IRAP instructions to which participants were exposed was explicitly designed to ensure that they understood the meanings of all six target words (e.g., FAULTY). Thereafter, a series of flash cards guided the children on how the program works. For illustrative purposes, the instructions presented to a female participant called Mary were as follows:

> *Sometimes the computer will want you to match your OWN NAME (MARY) with this set of words (participant was shown*

the three positive target stimuli), and sometimes it will want you to match the word PETER *to this set of words (participant is shown the three negative target stimuli). So, you might have to match your* OWN NAME *with* ACCEPTED *and* PETER *with* FAULTY.

Then the computer will change its mind and it will want you to match your OWN NAME *with this set of words (the three negative target stimuli) and the word* PETER *with this set of words (the three positive target stimuli). So, now you might have to match your* OWN NAME *with* FAULTY *and* PETER *with* ACCEPTED.

In order to match the words in this game you have to press either the 'd' or 'k' button on the keyboard. Can you show me where they are? They are the only two keys you have to press. You do not have to press anything else. Ok?

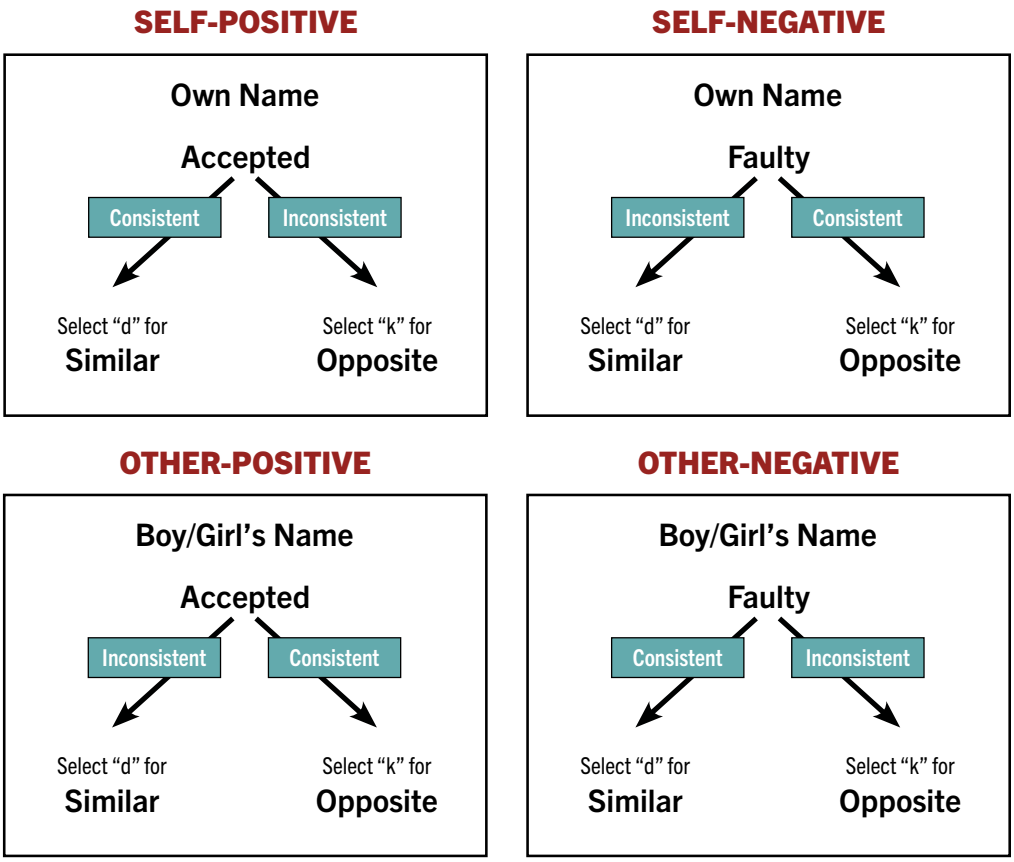


Figure 1. Schematic representation of the four IRAP trial-types (neither arrows nor consistent/inconsistent boxes were visible).

Now, there are two other words involved in this game - OPPOSITE and SIMILAR. So if I tell you that I want you to match your OWN NAME to ACCEPTED, POPULAR, and PERFECT and you see this coming up on the screen (child is presented with schematic representation of a consistent trial with OWN NAME) which key will you press? Will you press 'd' or 'k'?

Ok, so what happens if PETER and ACCEPTED come up on the screen, but I have told you that I want you to match your OWN NAME to ACCEPTED? What key would you press? Would you press 'd' or 'k'?

Now, like all games, there is a little trick involved between the words OPPOSITE and SIMILAR. Sometimes the word OPPOSITE is on this side of the screen (child is shown schematic representation of OPPOSITE on the left-hand side of the screen) and sometimes it is over on the other side of the screen (representation of OPPOSITE on the right hand side). It's also the same for the word SIMILAR. Sometimes it is on this side of the screen (left) and then it changes to the other side of the screen (right). So the trick is that you have to keep your eye on which side of the screen OPPOSITE and SIMILAR are on, because remember, you have to press 'd' or 'k' to match the words. So your job in this game is to keep your eye on the word at the top (i.e., OWN NAME or PETER), the word in the middle (e.g., ACCEPTED) and the places in which OPPOSITE and SIMILAR appear on the screen. Do you understand?

Flash cards also contained schematic representations of each of the four trial-types. This yielded a total of four pictures: Self-Positive (top left of Figure 1); Self-Negative (top right); Other-Positive (bottom left); and Other-Negative (bottom right). Participants received several practice trials with these visual illustrations before exposure to the automated procedure.

Participants were required to practice responding in ways deemed both consistent and inconsistent with their beliefs. Consistent responding required showing positivity towards the self (i.e., Self-Positive-SIMILAR and Self-Negative-OPPOSITE) and negativity towards others (Other-Positive-OPPOSITE and Other-Negative-SIMILAR). Inconsistent responding required participants to show negativity towards the self (Self-Positive-OPPOSITE and Self-Negative-SIMILAR) and positivity towards others (Other-Positive-SIMILAR and Other-Negative-OPPOSITE).

Each block of IRAP trials contained six exposures to each of the four trial-types randomly presented across the block (i.e., a total of 24 trials in each block). On each of the six exposures, each of the three target stimuli appeared twice with the same sample. For example, each participant was presented with six Self-Positive trials (i.e., two ACCEPTED, two POPULAR, and two PERFECT).

The IRAP sequence

The IRAP sequence was always presented as alternating blocks of consistent and inconsistent trials, hence requiring participants to switch responding across blocks. In order to control for potential

order effects, the sequencing of the blocks was counterbalanced across participants. That is, half of the children were presented with a consistent practice block first which required participants to respond in a pro-self/anti-other pattern (hereafter labeled as pro-self), followed by the inconsistent practice block which required them to respond in an anti-self/pro-other pattern (labeled as pro-other), followed by a consistent test block, and so on. In contrast, the other half were presented with an inconsistent practice block first, and so on.

Each complete IRAP comprised a total of eight blocks of trials, two practice blocks followed by six test blocks, always presented in that order. The first, third and fifth test blocks then required pro-self responding, while the second, fourth and sixth test blocks required pro-other responding. If the first practice block required participants to respond in a pro-other pattern, the alternative sequence ensued.

Practice blocks. At the beginning of each practice block and each of the first two test blocks, the children were given specific instructions on whether each block was a practice or test, and whether correct responding was consistent or inconsistent. The instructions provided regarding practice trials were specifically designed to teach the child (1) how to press the appropriate keys and (2) how to match the sample and target stimuli appropriately. The instructions provided to a male child (Sean) exposed to consistent trials first were as follows:

In order for you to learn how to play the game, we are going to do some practice. For this first practice I want you to match OWN NAME (SEAN) *to* ACCEPTED, PERFECT *and* POPULAR, *and* GIRL'S NAME *to* FAULTY, BROKEN, *and* USELESS. *I will help you through the first few matching tasks. Ok?*

Can you sit in close to the computer and make sure you are comfortable? Good, now show me where you are going to put your fingers. Remember, for this game you only need to press the 'd' and 'k' keys on the keypad. When you are ready, just press the space bar (Researcher indicated location of spacebar) and the game will start.

The first exposure to the first practice block was then presented. During the first few practice trials, the Researcher promoted each child by indicating the correct response option and the correct key associated with it. Prompting for correct responding continued until each child was familiar with correct responding (rarely exceeding 5 trials). If a child emitted an incorrect response during the initial practice trials, she/he was instructed as follows:

That's ok. Remember that I told you it is ok to get some wrong. All you have to do now is to press the correct key in order to go forward with the game. So, which key will you press?

Throughout the first practice block, the Researcher also intermittently provided verbal feedback on correct and incorrect responding.

At the end of each block of trials, the IRAP presented participants with automated feedback on the percentage of trials correct and the median response time (in ms.) achieved during that block. The Researcher provided the children with further clarification on the meaning of the scores. For example, if a child's median reaction time on the first practice block exceeded 3000ms., he/she were instructed as follows:

Ok. That was very good. You seem to be getting the hang of this game. There is one other thing I need to tell you. In order to get to the next level of the game you need to try and keep your score under 3000ms. Ok? And I still want you to try to get as many right as you can. Ok?

Hence, irrespective of performance, all children proceeded immediately with the second practice block.

The children were also instructed explicitly on how to switch responding across blocks. Consider the following instructions regarding the switch from a consistent to an inconsistent block for a female participant:

Ok, now do you remember that I told you that the computer sometimes changes its mind? This time it wants you to match OWN NAME *to* FAULTY, BROKEN *and* USELESS *and a* GIRL'S NAME *to* ACCEPTED, PERFECT, *and* POPULAR. *This is still only a practice just like the last time. But I want you to try and go as fast as you can, while still trying to get as many right as you can. Ok?*

These instructions and presentations were repeated for the second block of practice trials.

Test blocks. All of the children were invited to take a short break between the second practice block and the first test block. The first test block then commenced with the following instructions:

Ok, it's obvious that you have caught onto this game really quickly. So I think you are ready to go on to the next stage. We are going to do this six more times, but as you can see you get through the stages really quickly and we will count each task together when you have finished. Ok?

Now, this time I am not going to tell you which key to press. Ok? So, that means that the practice is now over and the computer is going to test you to see how much you remember. Ok? Before each matching task, I will just check with you to see if you remember which words you are matching to PETER *and which words you are matching to your* OWN NAME. *Is that ok?*

Now, for the next ones can you tell me which words you have to match PETER *to? (Researcher used the word lists to prompt the child and waited for a response). Now can you tell me which words you have to match your* OWN NAME *to? (Again, Researcher waited for the child's response).*

So, are you comfortable and ready to go? Make sure you have your fingers on the right keys. Remember -- try and go as fast as you can but still trying to get them right. Ok, off you go and press the space bar to begin.

The Researcher continued to provide positive verbal encouragement regarding appropriate on-task behavior (e.g., "you are doing well and working really fast"), but not for accurate or incorrect responding. At the end of the sixth and final test block, the Researcher indicated to the children that the game was over and thanked them for their participation. Each child was then given a packet of gel pens for taking part in the study.

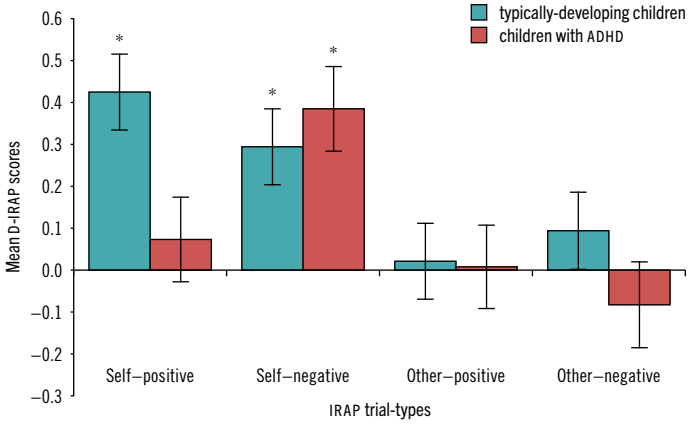


Figure 2. Mean D-IRAP Scores (including standard error bars) per group for each trial-type (asterisk denotes statistical significance from zero)

Feedback. Practice block feedback is outlined above. Test block feedback was incorporated into the IRAP program such that incorrect trials (but not correct trials) were consequated with written automatic feedback that indicated that an incorrect response had been emitted. This feedback involved the presentation of a red x that appeared automatically in the middle of the screen and remained there until a correct response was emitted. A visual representation of the feedback was presented along with the following instructions from the Researcher:

> *Ok. Like all games, you will sometimes match the words wrong and that's ok. The game is not about getting it right all of the time. Although it's important to get as many words right as you can, the trick is that you have to match the words as fast as you can while trying to get them right. Ok?*
>
> *If you get one wrong, the computer will show you this (child is presented with the schematic representation of feedback) and the only way you can go forward in the game is to press the correct key. So the computer will actually tell you when you have made a mistake, ok?*

A feedback reinforcer incorporating each participant's name saying, for example, "WELL DONE MARY" and cartoon pictures (e.g., a frog hopping out of the water) was incorporated into the program for correct responding and to encourage the children with ADHD to remain on task.

Performance criteria. The IRAP software recorded levels of accuracy and response latency for each participant on every trial. *Accuracy* was defined as the first response emitted on each trial. Hence, even if a subsequent accurate response was emitted on the same trial (because every trial incorporated a correction procedure for incorrect responding), the trial was recorded as incorrect. *Response latency* was defined as the time (in ms.) between the onset of the trial and the emission of a correct response. For inclusion in the current study, an accuracy rate of 70% and an average response latency of <3000ms was required in each block of trials.

» RESULTS

Implicit measure

The primary datum on the IRAP was response latency, defined as the time (in ms.) from trial onset to emission of the first correct response and this was below 3000ms. for each participant. The latency data were transformed using the D-algorithm (Barnes-Holmes et al., 2006). The steps involved in calculating the D-IRAP scores using this algorithm are presented below. In line with previous IRAP research, accuracy data are used as a screening procedure to remove participants whose accuracy levels in any blocks are lower than 70%. Each of the children included in these analyses exceeded this criterion.

The D-algorithm. The version of the D-algorithm employed in the current study transforms the raw latency data for each participant using the following steps: (1) only use response latency data from test blocks; (2) eliminate latencies above 10,000ms. From the dataset: (3) eliminate the data from a participant for whom more than 10% of test block trials have latencies less than 300ms.; (4) compute 12 standard deviations for the four trial-types - four for the response-latencies from Blocks 1 and 2, four from the latencies from Blocks 3 and 4, and a further four from Blocks 5 and 6; (5) compute the 24 mean latencies for the four trial-types in each test block; (6) compute difference scores for each of the four trial-types for each pair of test blocks by subtracting the mean latency of the consistent block from the mean latency of the corresponding inconsistent block; (7) divide each difference score by its corresponding standard deviation from step 4, yielding 12 D-IRAP scores - one score for each trial-type for each pair of test blocks; (8) calculate four overall trial-type D-IRAP scores by averaging the three scores for each trial-type across the three pairs of test blocks.

Preliminary analyses (within-group comparisons). Figure 2 presents the mean D-IRAP scores per trial-type and group. Both groups of participants indicated responding in a manner that showed pro-self biases in line with experimental predictions. It is important to emphasize that response latencies from anti-other blocks were subtracted from pro-other blocks, and thus positive scores indicate anti-other/pro-self biases, whereas negative scores indicate pro-other/anti-self biases. That is, the children overall more readily related positive stimuli with their own name (i.e., Self-Positive-SIMILAR over OPPOSITE) *and* more readily defended their own name against negative stimuli (i.e., Self-Negative-OPPOSITE over SIMILAR). However, the mean D-IRAP scores indicated that the pro-self bias in the Self-Positive trial-type was stronger for the typically-developing children, relative to those with ADHD. Conversely however, the pro-self bias in the Self-Negative trial-type was stronger for the children with ADHD, than those without.

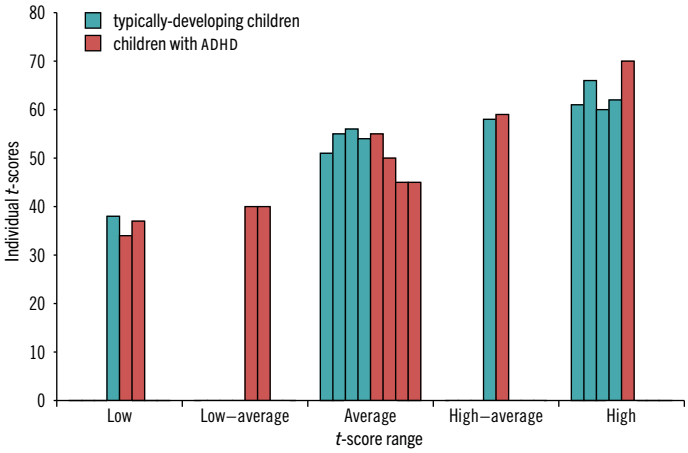


Figure 3. Individual PH2 *t*-scores by group and by category

The mean D-IRAP data also indicated very weak effects for both groups of children overall in relating positive stimuli with the other name (i.e., Other-Positive-SIMILAR and OPPOSITE). However, a pro-other bias in the Other-Negative trial-type was recorded for the children with ADHD (i.e., Other-Negative-OPPOSITE over SIMILAR), while an anti-other bias was recorded for the children without (i.e., Other-Negative-SIMILAR over OPPOSITE).

Mean score trial-type analyses. The D-IRAP means were entered into a 4x2 mixed repeated measures Analysis of Variance (ANOVA), with group as the between participant variable and trial-type as the within participant variable. There was a significant main effect for trial-type [$F(3, 18)$, = 4.67, $p = 0.0057$, $\eta_p^2 = 0.206$], with post-hoc analyses indicating that the difference lay on Self-Positive vs. Other-Negative and Self-Negative vs. Other-Positive trial-types. The main effect for group was non-significant ($p = 0.18$) and there was no significant interaction ($p = 0.21$).

Two separate one way ANOVAS (one per group) revealed a significant main effect for trial-type for the children with ADHD [$F(3, 9) = 3.361$, $p = 0.0333$, $\eta_p^2 = 0.272$] and an effect that approached significance for those without [$F(3, 9)$, = 2.585, $p = 0.0557$, $\eta_p^2 = 0.241$]. Post-hoc analyses of trial-types indicated significant differences on Self-Negative vs. Other-Positive and vs. Other-Negative (p's < 0.03) for the children with ADHD. There was also a significant difference on Self-Positive vs. Other-Positive ($p < 0.04$) for those without.

Eight one sample *t*-tests were conducted to determine whether each of the trial-type D-IRAP scores differed significantly from zero. Self-Positive was significant for the typically-developing children ($p < 0.01$), but not for the children with ADHD. Self-Negative was significant for both groups (p's < 0.02).

Four independent samples *t*-tests were conducted to analyze differences between the groups on each trial-type, and only responding on the Self-Positive trial-type was significantly different between children with ADHD and children without ($p < 0.04$).

Explicit measure

The *t*-scores for individuals in each group are presented in Figure 3. Of the 10 typically-developing children, one scored within the low range; four scored as average; one as high-average; and four as high. The group produced an overall mean *t*-score of 56 (i.e., high-average). The pattern of explicit self-esteem differed somewhat with the 10 children with ADHD. That is, two scored as low; two as low-average; four as average; one as high-average; and one as high, The group produced an overall mean *t*-score of 56 (i.e., average range).

The subscales of the PH2 were also analyzed (see Figure 4). The children with ADHD produced lower scores on all six subscales than the typically-developing children. However, it was only on Behavioral Adjustment and Popularity that the children with ADHD scored below average (i.e., low).

Correlations between the implicit and explicit measures

Correlations were calculated using Pearson's correlation coefficient for self-esteem scores for both groups of children on the PH2 *t*-score and the four D-IRAP scores. For the children with ADHD, the *t*-score correlated significantly with the Self-Positive trial-type ($r = .787$, $p = 0.007$) and with Other-Negative ($r = -0.806$, $p = 0.005$). However, there were no significant correlations for the typically-developing children (p's > 0.362).

Pearson's correlation coefficient was also used to assess correlations among the D-IRAP scores and the PH2 subscales. For the children with ADHD, Self-Negative significantly correlated with Behavioral Adjustment ($r = 0.703$, $p = 0.023$); Other-Positive correlated significantly with Popularity ($r = -0.758$, $p = 0.011$); and Other-Negative correlated significantly with Behavioral Adjustment ($r = 0.640$, $p = 0.046$). Again, for the typically-developing children, there were no significant correlations (p's > 0.05).

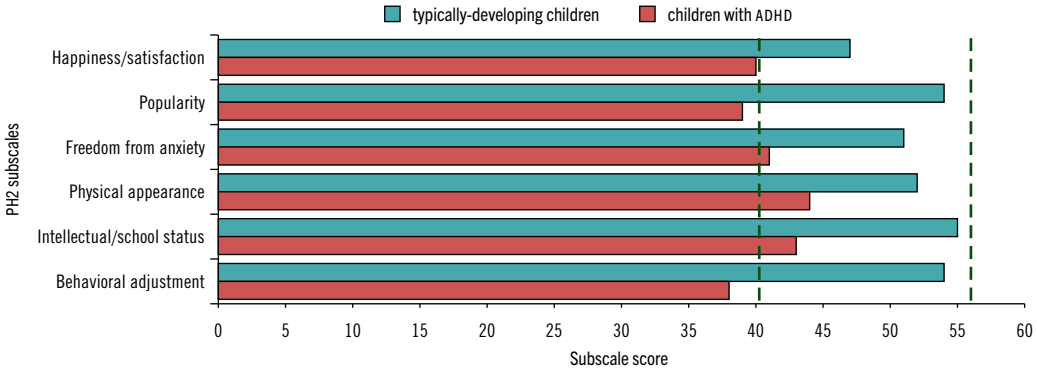


Figure 4. PH2 subscale scores for all participants by group (lines denote where average scoring should fall)

Summary of results

The results on the IRAP indicated that the typically-developing children had a stronger pro-self bias to their own name than the children with ADHD. Furthermore, the typically-developing children demonstrated an anti-other bias, while the children with ADHD demonstrated a pro-other bias. Differences were also observed on the PH2. Specifically, while both groups presented within the normal range of self-esteem, the typically-developing children had a higher average *t*-score than the children with ADHD. Furthermore, the children with ADHD scored within the low-to-low-average range across all of the subscales, while the typically-developing children scored as average.

Study 2

Study 2 was identical to Study 1, except that the sample of children with ADHD was replaced by a sample of children with dyslexia. The latter group of children were selected based on the possibility that they may present with reading challenges during the IRAP.

» METHOD

Participants

Twenty additional children were recruited for participation in Study 2. They ranged in age from 9 to 14 years (M = 10 years, 2 months). The 10 children with dyslexia (6 males and 4 females) all had an independent diagnosis of dyslexia, but were categorized as within the 'normal' range of intellectual functioning.

Setting

All aspects of the setting employed in Study 2 were identical to Study 1.

Apparatus, materials, and procedure

All aspects of the apparatus, materials, and procedure in Study 2 were identical to Study 1.

» RESULTS

Implicit measure

The latency data were again transformed into D-IRAP scores as in the previous study. Each of the children included in these analyses exceeded a criterion level of 70% accuracy and all response latencies were below 3000 ms.

Preliminary analyses (within-group comparisons). Figure 5 presents the mean D-IRAP scores per trial-type and group. Both groups of participants indicated responding in a manner that showed pro-self biases in line with experimental predictions. Similar to the results in Study 1, the children overall more readily related positive stimuli with their own name (i.e., Self-Positive-SIMILAR over OPPOSITE) *and* more readily defended their own name against negative stimuli (i.e., Self-Negative-OPPOSITE over SIMILAR). However, the mean D-IRAP scores indicated that the pro-self bias in the Self-Positive trial-type was slightly stronger for the children with dyslexia, relative to those without. The pro-self bias in the Self-Negative trial-type was the same for both groups.

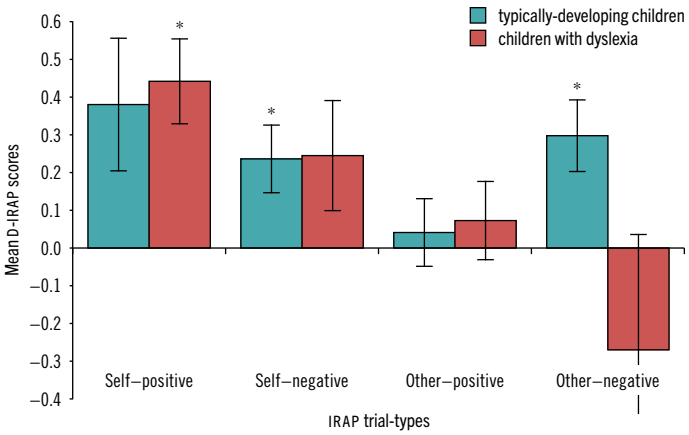


Figure 5. Mean D-IRAP Scores (including standard error bars) per group for each trial-type (asterisk denotes statistical significance from zero)

The mean D-IRAP data also indicated very weak effects for both groups overall in relating positive stimuli with the other name (i.e., Other-Positive-SIMILAR and OPPOSITE). However, a pro-other bias in the Other-Negative trial-type was recorded for the children with dyslexia (i.e., Other-Negative-OPPOSITE over SIMILAR), while an anti-other bias was recorded for the children without (i.e., Other-Negative-SIMILAR over OPPOSITE).

Mean score trial-type analyses. The D-IRAP means were entered into a 4 × 2 mixed repeated measures ANOVA. There was a significant main effect for trial-type [$F(3, 18)$, = 2.991, p = 0.0388, η_p^2 = 0.143], with post-hoc analyses indicating that the difference lay on Self-Positive vs. Other-Positive trial-types (p < 0.01). The main effect for group was non-significant (p = 0.36) and there was no significant interaction (p = 0.12).

Two separate one-way ANOVAS (one per group) revealed a main effect for trial-type for the children with dyslexia which approached significance [$F(3, 9)$, = 2.874, p = 0.054, η_p^2 = 0.242], but this was not significant for the typically-developing children (p = 0.21). Post-hoc analyses of trial-types indicated significant differences on Self-Positive vs. Other-Positive trial-type (p < 0.01) for the children with dyslexia. There were no significant differences between trial-types for the typically-developing children (p's > 0.05).

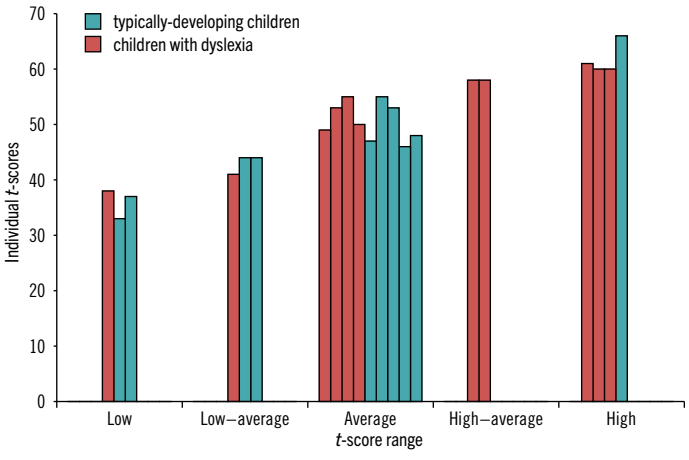


Figure 6. Individual PH2 *t*-scores by group and by category

Eight one sample *t*-tests were conducted to determine whether each of the trial-type mean D-IRAP scores differed significantly from zero. Self-Positive was significant for the children with dyslexia ($p < 0.004$), and approached significance for typically-developing children ($p = 0.059$). Self-Negative ($p = 0.03$) and Other-Negative ($p = 0.01$) were both significant for the typically-developing children. Four independent samples t-tests were conducted and found no differences between the groups on each trial-type (p's > 0.05).

Explicit measure

The *t*-scores for individuals in each group are presented in Figure 6. Of the 10 typically-developing participants, one child scored within the low-average range; four scored as average; two as high-average, and three as high. Of the 10 children with dyslexia, two scored as low; one as low-average; five as average; and one as high. The similarities across the two groups were also reflected in the group means, with the self-esteem mean for the children with dyslexia at 47.30 and 55 for those without (both average).

The subscales of the PH2 were also analyzed (see Figure 7). The children with dyslexia produced lower scores on all six subscales than the typically-developing children. However, it was only on Intellectual/School Status and Physical Appearance that the children with dyslexia scored below average (i.e., low-average).

Correlations between the implicit and explicit measures

Correlations were calculated using Pearson's correlation coefficient for self-esteem scores for both groups of children on the PH2 *t*-score and the four D-IRAP scores. The *t*-score did not correlate with any trial-type in either group of children (p's > 0.11).

Pearson's correlation coefficient was also used to assess correlations among the D-IRAP scores and the PH2 subscales. For the typically-developing children, Self-Positive correlated significantly with Freedom from Anxiety ($r = 0.641$, $p = 0.046$). For the children with dyslexia, Self-Positive correlated significantly with Intellectual/School Status ($r = -0.672$, $p = 0.033$) and Other-Negative correlated significantly with Happiness/Satisfaction ($r = -0.771$, $p = 0.009$).

» OVERALL SUMMARY OF RESULTS

Some pro-self differences emerged across the three groups of children involved in the study. That is, Study 1 indicated that typically-developing children had a stronger pro-self bias when relating positive stimuli to the self, than the children with ADHD (i.e., D-IRAP score was almost five times greater). However, the two groups were equally reticent when relating negative stimuli to the self. Conversely, in Study 2, the two groups of children showed equally positive pro-self biases as indicated by the independent *t*-tests.

Some pro-other differences were also detected across the groups. In Study 1, the children with ADHD demonstrated a pro-other bias when relating negative stimuli to others, while the typically-developing children demonstrated a predicted anti-other bias. This suggests that the children with ADHD denied the relation between negative stimuli and others. Similarly, in Study 2, the children with dyslexia showed a pro-other bias which was also absent in typically-developing children.

Notably in Study 1, the pro-self bias in the children with ADHD was consistent with the explicit scores as it correlated with the *t*-score and the Behavioral Adjustment subscale. The pro-other bias in the children with ADHD was also consistent with the *t*-scoreand the Popularity and Behavioral Adjustment subscales. In Study 2, the pro-self bias was consistent with the PH2 Intellectual/School Status subscale in the children with dyslexia and Freedom from Anxiety in those without. The pro-other bias correlated with the PH2 Happiness/Satisfaction subscale in the children with dyslexia. The PH2 depicted in both studies that while all four samples fell within the normal range of self-esteem, the typically-developing children presented with higher overall self-esteem.

» DISCUSSION

The primary aim of the current research was to determine the utility of the IRAP in measuring implicit cognitions in typically-developing children and children presenting with ADHD or dyslexia. Indeed, one might expect that difficulties in attention and cognition pose a challenge to measures of implicit cognition because of the high accuracy and response latency criteria. However, this was not the case with any child who participated currently. All children proceeded rapidly, and with ease, through all aspects of the IRAP. Indeed, they all individually reported that they found the procedure both positive and challenging. This suggests, at least, the broad utility of the IRAP as a simple series of child-friendly computerized tasks. This procedural ease has not been readily reported with other implicit measures, such as the IAT, which has undergone numerous procedural modifications with mixed success, even with typically-developing children.

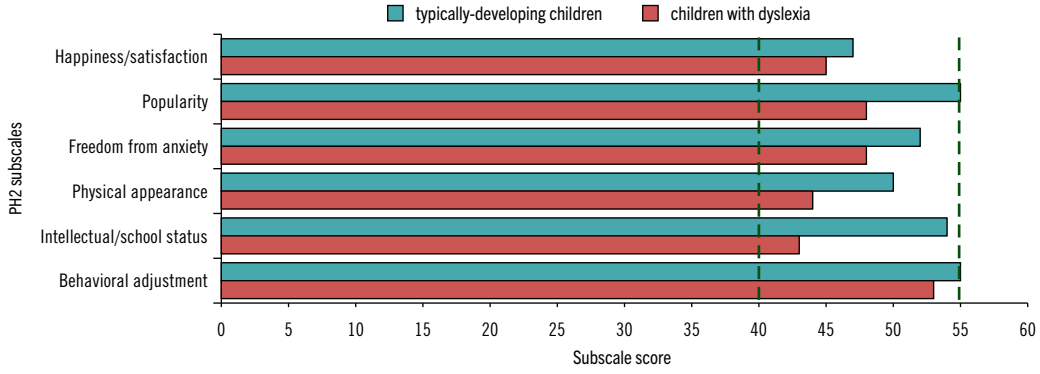


Figure 7. PH2 subscale scores for all participants by group (lines denote where average scoring should fall)

Nonetheless, it is important to emphasize that the current research employed a number of specific precautions to ensure that the children understood how to complete the tasks appropriately. These included: screen-shots of the target trial-types; extensive verbal and concrete instructions; and some verbal coaching during practice trials. It seems likely that the presence of these features greatly helped the children in terms of task motivation and com-

pletion. However, numerous studies have reported the use of similar features when administering the IRAP to adults from both typical and atypical samples (e.g., Vahey, Boles, & Barnes-Holmes., 2010).

The secondary aim of the current research was to preliminarily explore the use of the IRAP as a measure of implicit self-esteem in children. The current research generated sound and predicted IRAP effects for each group of participants. That is, the children in each group showed predicted positivity towards the self and negativity towards others (i.e., a pro-self and anti-other bias).

The outcomes recorded here for the two groups of typically-developing children were consistent with the existing literature on the development of self-esteem. These children in both studies showed strong implicit pro-self biases (Rathus, 2006). Specifically, they showed strong implicit and explicit positivity towards the self and depicted considerable implicit negativity towards others. This also supports RFT research on the development of perspective-taking, which appears to be well-established by age 5 (McHugh, Barnes-Holmes, & Barnes-Holmes, 2004). The findings that emerged for the children with ADHD and dyslexia on both measures were markedly different and highlighted some of the difficulties, including popularity and behavioral adjustment that this cohort of children experience (Bussing, Zima, & Perwien, 2000; Mrug, Hoza, Pelham, Gnagy, & Greiner, 2007).

In Study 1, there was a weak pro-self bias recorded for the group of children with ADHD which was consistent with the literature (Barber et al., 2005; Biederman, 2005; Edbom et al., 2006; Ek et al., 2008; Treuting & Hinshaw, 2001). The differences that emerged on the implicit and explicit measures for the children with ADHD add to the debate within the literature about the level of self-esteem that typically characterizes the group. The overall explicit scores support the view that children with ADHD present with normal self-esteem. However, the subscale data highlight specific areas of difficulties which may influence self-esteem levels over time (Rubin, 1998). Indeed, subscale information could prove valuable for the purposes of intervention, even when the overall self-esteem appears normal. This may be one aspect that accounts for the debate on whether or not one should expect normal or low self-esteem for the group.

The use of the IRAP offered a more comprehensive view of the ADHD profile of self-esteem regarding how this group viewed the self compared to others. The pro-other bias found concords with existing evidence that these individuals are more sensitive to the perceptions of others, including peers, family and teachers (Guevremont & Dumas, 1994; Wheeler & Carlson, 1994). Specifically, if individuals compare themselves to others and discriminate disparities, then they are more likely to favour others. This overestimation of others can be supported by two pieces of evidence. First, these individuals have been known to discriminate their own behavioral difficulties as problematic for themselves and *others*. This would likely render their perceptions of others as more positive (Hoza et al., 2005). Second, a range of significant psychological and/or emotional difficulties, including Oppositional Defiance Disorder often accompany the diagnosis (Barkley, 2003). Self-perceptions of these difficulties coupled with the access to support services offered by others would likely alter attitudes to others. Moreover, findings relating to popularity and behavioral adjustment further reflect the importance of others' attitudes towards these children. Overall, the findings suggesting that self-esteem is within the average range was relatively consistent with the literature due to the tendency to focus on the positivity of others, rather than the negative (Stewart et al., 1994; Hoza et al., 1993).

The findings from Study 2 depicted how the children with dyslexia presented with equal levels of implicit self-esteem as those without. The data were also consistent with the findings on the explicit measures where all children scored within the average range of self-esteem. This was consistent with the explicit measure, despite the absence of notable correlations. This might imply that, although the individual diagnosis of dyslexia may impact upon their self-esteem, this has not been a negative influence on aspects of the related self. Furthermore, children diagnosed with dyslexia early in their lives, frequently have access to support services which commonly include emphasis on self-esteem building (Dyslexia Association of Ireland, 2007). It can be deduced that having such a learning difficulty may not necessarily pose sufficient intellectual, emotional, or educational challenges to significantly differentiate this group from their typically-developing counterparts, at least with regard to self-esteem. These outcomes, at least, support the well-established view that a sense of self is a complex and broad feature of human development (Berger, 1998).

The sensitivity of the IRAP was again highlighted in the current study when the data indicated the distinction between the samples regarding their implicit attitudes to others. The children with dyslexia showed a pro-other bias which was absent in the typically-developing children. Interestingly, this bias correlated with happiness and satisfaction. *Again*, these findings were unexpected, but not surprising. Future IRAPS may target a sample of children with a more challenging form of disability, such as Emotional Behavioral Disturbance (EBD), in order to find greater distinctions in self-esteem in a young population.

It was anticipated that the children with dyslexia would require further procedural modifications, but this was not necessary. The only difference between the progression of this group and the typically-developing group through the IRAP was their increased response latencies. Also, because a response latency measure is incorporated into the correction procedure, the children with dyslexia did not make more errors than the typically-developing children. Taken together, the potential utility of the IRAP for measuring implicit cognitions in children with specific learning difficulties can be highlighted.

The current body of research was the first to examine the utility of the IRAP with children, including children presenting with specific deficits. There have been a limited number of studies which aimed to measure the implicit cognitions of children using the IAT. However, numerous modifications were required to render the procedure child-friendly. This was not necessary in the current research as the IRAP did not require further modifications than required with an adult sample. The data also yielded interesting findings relating to the self and others in the four samples of children. However, since advocating potential differences between the groups was not the primary aim of this research, further research would be required to investigate any potential behavioral implications of such implicit differences. Overall, the current work suggests a potentially positive trajectory for the IRAP as a measure of implicit attitudes and cognitions with a range of populations including children and those with learning difficulties. ■

REFERENCES

Barber, S., Grubbs, L., & Cottrell, B. (2005). Self-perception in children with attention-deficit/hyperactivity disorder. Journal of Paediatric Nursing, 20, 235–245.

Barkley, R.A. (2003). Attention-deficit hyperactivity disorder. In E.J. Marsh & R.A. Barkley (Eds), Child psychopathology (2nd ed.) 75–143. New York: Guilford Press.

Barnes-Holmes, D., Barnes-Holmes, Y., Haydn, E., Milne, R., Power, P., & Stewart. I. (2006). Do you really know what you believe? Developing the Implicit Relational Assessment Procedure (IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist, 32,* 169- 177.

Baron, A.S., & Banaji, M.R. (2006). The development of implicit attitudes: Evidence of race evaluations from ages 6 and 10 and adulthood. *Psychological Science, 17,* 53–58.

Berger, K.S. (1998). *The developing person: Through the life span. 4th Edition.* New York. Worth.

Biederman, J. (2005). Attention-Deficit/Hyperactivity Disorder: A selective overview. *Biological Psychiatry, 57,* 1215–1220.

Bussing, R., Zima, B., & Perwien, A.R. (2000). Self-esteem in special education children with ADHD: Relationship to disorder characteristics and medication use. Journal of American Academy of Child and Adolescent Psychiatry, 39, 1260–1269.

Cvencek, D., Greenwald, A.G., & Meltzoff, A.N. (2011). Measuring implicit attitudes of 4-year-olds: The Preschool Implicit Association Test. Journal of Experimental Child Psychology, 109 (2), 187–200.

de Jong, P., Pasman, W., Kindt, M., & van den Hout, M.A. (2001). A reaction time paradigm to assess (implicit) compliant-specific dysfunctional beliefs. Behavior Research and Therapy, 39, 101–113.

de Jong, P. (2002). Implicit self-esteem and social anxiety: Differential self-positivity effects in high and low anxious individuals. Behavior Research and Therapy, 40, 501–508.

De Houwer, J. (2006). Using the implicit association test does not rule out an impact of conscious propositional knowledge on evaluative conditioning. Learning and Motivation, 37, 176–187.

Dunham, Y., Baron, A., & Banaji. M. (2006). From American city to Japanese village; A cross-cultural investigation of implicit race attitudes. *Child Development, 71,* 1223–1240.

Dyslexia Association of Ireland (2007). Annual Report and Accounts. [Published Report]. Retrieved from http://www.dyslexia.ie/wp-content/uploads/2010/12/Annual-Report-2007.pdf.

Eagly, A.H., & Mladinic, A. (1989). *Gender stereotypes and attitudes toward women and men. Personality and Social Psychology Bulletin, 15*, 543–558.

Ebert, I.D., & Steffens, M.C. (2008). *Generality and correlates of the implicit preference for women.* Paper presented at the 11th Jena workshop on intergroup processes: Positive behavior between social groups - processes, problems, and promises, Oppurg, Germany. Abstract retrieved from http://www.sozialpsychologie.uni-dena.de/fileadmin/sp/media/Aktivitaeten/Schedule_Intergroup_Workshop_2008.pdf.

Edbom, T., Lichtenstein, P., Granlund, M., & Larsson, J. (2006) Long-term relationships between symptoms of attention deficit hyperactivity disorder and self-esteem in a prospective longitudinal study of twins. *Acta Paediatrica, 95,* 650–657.

Ek, U., Westerlund, J., Holmberg, K., & Fernell, E. (2008) Self-esteem in children with attention and/or learning deficits: the importance of gender. *Acta Paediatrica, 97,* 1125–1130.

Gemar, M.C., Segal, Z.V. Segratti, S., & Kennedy, S.J. (2001). Mood-induced changes on the Implicit Association Test in recovered depressed patients. *Journal of Abnormal Psychology, 110,* 282–289.

Greenwald, A.G. & Banaji., M.R. (1995). Implicit social cognition: Attitudes, self-esteem and stereotypes. Psychological Review, 10, 4–27.

Greenwald, A.G. McGhee. D.E., & Schwartz,. J.L. (1998). Measuring individual differences in implicit cognition; the implicit association test. Journal Personality and Social Psychology, 74, 1464–80.

Gresham, F.M., MacMillan, D.L., Bocian, K.M., Ward, S.L., & Forness, S.R. (1998). Comorbidity of hyperactivity-impulsivity-inattention and conduct problems: risk factors in social, affective, and academic domains. *Journal of Abnormal Child Psychology, 26,* 393–406.

Guevremont, D.D., & Dumas, M.C. (1994). Peer relationship problems and disruptive behavior disorders. Journal of Emotional and Behavioral Disorders, 2, 164–172.

Hayes, S.C., Barnes-Holmes, D. & Roche, B. (2001). Relational Frame Theory: A post- Skinnerian account of human language and cognition. New York: Kluwer/Plenum.

Hoza, B., Gerdes, A.C., Hinshaw, S.P., Arnold, L., Pelham, W. r., Molina, B.G., & ... Wigal, T. (2004). Self-Perceptions of Competence in Children With ADHD and Comparison Children. Journal of Consulting And Clinical Psychology, 72(3), 382–391.

Hoza, B., Mrug, S., Gerdes, A.C., Hinshaw, S.P., Bukowski, W.M., Gold, J.A., & ... Arnold, L. (2005). What Aspects of Peer Relationships Are Impaired in Children With Attention-Deficit/Hyperactivity Disorder? Journal of Consulting and Clinical Psychology, 73(3), 411–423.

Hoza, B., Pelham, W.E., Dobbs, J., Owens, J.S., & Pillow, D.R. (2002). Do boys with attention- deficit/hyperactivity disorder have positive illusory self-concepts? Journal of Abnormal Psychology, 111, 268–278.

Hoza, B., Pelham, E.E., Milich, R., Pillow, D., & McBride, K. (1993). The self-perceptions and attributions of attention deficit hyperactivity disordered and non-referred boys. Journal of Abnormal Child Psychology, 3, 271–286.

Hughes, S., Barnes-Holmes, D. & Vahey, N. (2012). Holding on to our functional roots when exploring new intellectual islands: A voyage through implicit cognition research, *Journal of Contextual Behavioral Science, 1* (1–2), 17–38.

McHugh, L., Barnes-Holmes, Y., & Barnes-Holmes, D. (2004). A relational frame account of the development of complex cognitive phenomena: Perspective-taking, false belief understanding, and deception. International Journal of Psychology and Psychological Therapy, 4 (2), 303–324.

Mrug, S., Hoza, B., Pelham, W.E., Gnagy, E.M., & Greiner, A.R. (2007). Behavior and peer status in children with ADHD: Continuity and Change. Journal of Attention Disorders 10, 359–371.

Nicholson, E., & Barnes-Holmes, D. (2012). The Implicit Relational Assessment Procedure (IRAP) as a Measure of Spider Fear. The Psychological Record, 62, 263–278.

Nosek, B.A. (2007). Implicit–explicit relations. Current Directions in Psychological Science, 16, 65–69.

Owens, J.S., Goldfine, M.E., Evangelista, N.M., Hoza, B., & Kaiser, N.M. (2007). A critical review of self- perceptions and the positive illusory bias in children with ADHD. Clinical Child Family Psychology, 10, 335–351.

Piers, E.V., & Herzberg, D.S. (2003). Piers Harris children's self Concept Scale 2 Manual. Western Psychological Services. Los Angeles.

Rathus. S.A. (2006). Childhood. Voyages in Development (2nd Ed). Thomson. U.S.A.

Rubin. A.L. (1998). ADHD in Adolescents; Diagnosis and Treatment. Guilford Press. London.

Rudman, L.A., &. Goodwin, S.A. (2004). Gender differences in automatic in-group bias: Why do women like women more than men like men? Journal of Personality and Social Psychology, 87, 494–509.

Rutland, A., Cameron, L., Milne, A., & McGeorge. P. (2005). Social norms and self-presentation: Children's implicit and explicit intergroup attitudes. *Child Development, 76,* 451–466.

Selikowitz, M. (2004). ADHD: The facts. Oxford University Press. Oxford.

Skowronski, J. J., & Lawrence, M. A. (2001). A comparative study of the implicit and explicit gender attitudes of children and college students. *Psychology of Women Quarterly, 25,* 155–165.

Steele, R. S., & Morawski, J. G .G. (2002). Implicit cognition and the social unconscious. Theory & Psychology, 12, 37 -54.

Stewart. J., & Buggy, T. (1994). Social status and self-esteem: Children with ADHD and their peers. (ERIC Document Reproduction Service No. ED 400 630).

Teachman, B. A., Gregg, A. P., & Woody, S. R. (2001). Implicit associations of fear relevant stimuli among individuals with snake and spider-fears. Journal of Abnormal Psychology, 110, 226–235.

Treuting, J. J., & Hinshaw, S. P. (2001). Depression and self-esteem in boys with attention- deficit/hyperactivity disorder: associations with comorbid aggression and explanatory attributional mechanisms. Journal of Abnormal Child Psychology, 29, 23–39.

Vahey, N. A., Barnes-Holmes, D., Barnes-Holmes, U., & Stewart, I. (2009). A first test of the Implicit Relational Assessment Procedure (IRAP) as a measure of self-esteem: Irish prisoner groups and university students. *The Psychological Record, 59,* 371–388.

Vahey, N., Boles, S., & Barnes-Holmes, D. (2010). Measuring adolescents' smoking-related social identity preferences with the Implicit Relational Assessment Procedure (IRAP) for the first time: A starting point that explains later IRAP evolutions. *International Journal of Psychology and Psychological Therapy, 10,* 453–474.

Wheeler, J. C., & Carlson, C. L. (1994). The social functioning of children with ADD with hyperactivity and ADD without hyperactivity: A comparison of their peer relations and social deficits. Journal of Emotional and Behavioral Disorders, 2, 2–12.

Wiers, R. W., Teachman, B. A. & De Houwer, J. (2007). Implicit cognitive processes in psychopathology: An introduction. *Journal of Behavior Therapy and Experimental Psychiatry, 38,* 95–104.

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Using the T-IRAP interactive computer program and applied behavior analysis to teach relational responding in children with autism

Helen Kilroe, Carol Murphy, Dermot Barnes-Holmes & Yvonne Barnes-Holmes

National University of Ireland Maynooth

ABSTRACT

The IRAP computer software program was adapted as an interactive teaching tool (T-IRAP) targeting relational frames with four children with diagnosed autism aged 8–10 years. An adaptation of a multiple-baseline design was used to compare participants' relational learning in terms of speed and accuracy during Table-Top (TT) and T-IRAP teaching. The TT procedure was commenced with all participants simultaneously, and the T-IRAP was introduced at stepwise time intervals (after 5, 10, 15, 20 trial blocks) across the four participants. Nonarbitrary then arbitrary coordination, comparative, opposition and derived relations were targeted. Results showed that the T-IRAP was successfully adapted to teach all targeted relations, and in general greater speed and accuracy in relational responding were shown for all four participants during T-IRAP teaching compared with TT teaching. Thus the T-IRAP may be a useful supplementary teaching tool in applied settings.

KEYWORDS: autism, T-IRAP, DRR, computerised interactive teaching, flexibility

Applied behavior analysis (ABA) is the application of Skinner's (1938, 1957) basic research on the principles of behavior to address a wide range of human problems. This scientific approach has been found to be efficacious over many decades, and successful behavioral treatment areas include emotional disturbance (Matson & Coe, 1992), AIDS prevention (DeVries, Burnette & Redman, 1991), health and exercise (DeLuca & Holborn, 1992), gerontology (Gallagher & Keenan, 2000) and especially the treatment of individuals with developmental disabilities, most notably autism (Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Sallows, & Graupner, 2005; Cohen, Amerine-Dickens & Smith, 2006; Smith, Eikeseth, Klevstrand, & Lovaas,1997). Children with autism and related language difficulties have benefited greatly from the application of behavior analysis to establish or enhance verbal skills, and the efficacy of ABA with populations with autism has been widely reported even by sources outside and independent of behavior analysis (e.g., American Academy of Pediatrics Council on Children With Disabilities (Myers & Johnson, 2007); New York State Department of Health Early Intervention Program [Satcher,1999]; American Academy of Pediatrics, 2001; National Research Council, 2001; Maine Administrators of Services for Children with Disabilities, 2000). Teaching language skills is traditionally a primary intervention in ABA because it is considered pivotal (Koegel, Koegel & Carter, 1998) in that it can lead to enhanced social and academic skills. The approach taken is based on Skinner's *Verbal Behavior* (1957), which is a functional account of language comprised of separate verbal operants (e.g., mands, tacts, echoics, intraverbals, autoclitics) that are controlled by antecedents and consequences. Teaching programs in ABA arrange antecedent conditions and contingent positive reinforcement to establish verbal operants with children with delayed speech, and early intervention programs in particular target mands and tacts (Sauter & LeBlanc, 2006) which encompass requesting and labelling objects.

The use of positive reinforcement to teach specific and individual verbal operants is in accord with the principles of behavior derived from basic or experimental science, and might be termed *direct* reinforcement. For example, teaching a directly reinforced mand may involve an antecedent of holding up a preferred item such as "Teddy" before a child and delivering the item when the child requests by saying "I want Teddy". If the child fails to emit the mand, then "Teddy" is withheld. However, it has been suggested that a teaching approach that uses *only* this type of direct reinforcement to establish single verbal operants may be insufficient to promote the generativity that is widely reported as characteristic of language (Hayes, Barnes-Holmes & Roche, 2001; Rehfeldt & Barnes-Holmes, 2009). Thus, ABA programs targeting verbal behavior could be made more comprehensive by synthesising direct reinforcement procedures and complex *derived* responding which may help establish or enhance generative language and untaught novel utterances (see Murphy, Barnes-Holmes & Barnes-Holmes, 2009; Rosales & Rehfeldt, 2007). The point being made is that in addition to responding learned via direct reinforcement, behavioral

Correspondence concerning this article should be addressed to Carol Murphy, JH Building, Department of Psychology, National University of Ireland Maynooth, Maynooth, Co. Kildare, Ireland. Email: Carol.A.Murphy@nuim.ie

research involving stimulus equivalence has shown that humans also respond to more complex contingencies of reinforcement that are less immediately apparent (Sidman, 1971). Stimulus equivalence describes responding to one stimulus in terms of another; for example, imagine a child who likes cookies is taught to relate the name *cookie* to the object *cookie* (equivalent), and subsequently taught that *cookie* and *biscuit* are the same (equivalent) – the child may then smile upon hearing the word *biscuit,* and may ask for a biscuit without having been directly taught to. The child is now responding to the word *biscuit* similarly as to the word *cookie*. The mand function directly taught with *cookie* emerges for *biscuit* based on equivalence relations and a transfer of functions effect (Sidman, 1971). If the child also learns that *cracker* is like *biscuit*, the functions taught for *cookie* may also emerge for *cracker*, and again the child may request a cracker without ever having been directly reinforced for doing so. Briefly, stimulus equivalence means that if humans are taught that stimulus A, B and C are equivalent, functions taught for one of the stimuli will emerge for the other stimuli without direct reinforcement, and this phenomenon has been well-documented in laboratory research (Sidman, 1971, 1994). Derived responding is a complex and important type of responding that has been found to encompass many emergent relations in addition to equivalence or coordination relations (SAME-AS); for example, derived comparative relations (MORE-LESS), derived opposition relations, derived deictic relations (e.g., I-YOU-SHE) and many more. This type of responding is termed arbitrarily applicable relational responding (for a full account see Hayes et al., 2001), and arbitrary relations involve more subtlety. Specifically, nonarbitrary coordination relations involve physical similarity as with identical pictures or objects. Arbitrary coordination relations, however, are socially designated as with language where the word "tree" does not bear a physical resemblance to the object "tree", and the symbolic H_2O bears no similarity to water. Learning to respond to relations such as SAME/DIFFERENT based on the physical characteristics of stimuli is obviously advantageous and necessary. However, learning to respond to SAME/DIFFERENT relations that are socially and arbitrarily assigned in a particular context is more complex, and may be essential to advanced language and cognitive skills (Hayes et al., 2001). Thus, an aim in the current research was to build complexity in relational repertoires by teaching arbitrary SAME/DIFFERENT relations. Because the current research is an applied study, the procedure for teaching arbitrary SAME/DIFFERENT relations used stimuli that have practical value; specifically, relations were taught between numerical and percentage symbols that have been previously assigned by the verbal community. These stimuli are arbitrary in that, for example, *50%* bears no physical similarity to ½ and the 'sameness' is designated verbally by the social community.

The precise manner in which derived relational responding (DRR) occurs is not entirely apparent, but it may be that this type of responding is learned primarily via modelling, multiple exemplar training, and positive reinforcement from the social community (Hayes et. al., 2001). Research has shown that even a small number of taught relations among stimuli may generate a great many derived relations (Wulfert & Hayes, 1988). This is an important point because it suggests to behavior analysts that the derived relational responding paradigm may direct us toward teaching that results in exponential learning of the kind evidenced in human language. Although real world teaching applications with DRR have been quite limited until recently, modern behavioral researchers have scripted many programs that integrate DRR within ABA programs in order to build advanced and complex cognitive repertoires of responding (Rehfeldt & Barnes-Holmes, 2009). Derived manding has been established with children with autism, and with other populations with developmental disorder (Murphy, Barnes-Holmes & Barnes-Holmes, 2005; Murphy & Barnes-Holmes, 2009; Rosales & Rehfeldt, 2005). Derived comparative (more/less) and opposition relational skills have also been demonstrated with young children (Barnes-Holmes, Barnes-Holmes & Smeets, 2004; Barnes-Holmes, Barnes-Holmes, Smeets, Strand & Friman, 2004). Interestingly, a recent study by Cassidy, Roche and Hayes (2011), taught fluent derived relational responding to eight children with a range of educational and behavioral difficulties, and seven out of eight subsequently showed an increase in IQ scores. The full scale intelligence quotient scores for the seven children rose by at least one standard deviation on the *Wechsler Intelligence Scale for Children* (WISC-IVUK; Wechsler, 2004) when compared to measurement at baseline, prior to teaching procedures. At baseline, the children's Full Scale IQ scores ranged from 70 to 92, with half of the children falling below 85. Following the DRR intervention, children's IQ scores ranged from 76 to 111, with only one child showing an IQ score that remained below 85. The importance of these findings lies in the fact that IQ scores tend to remain stable throughout development (Moffitt, Caspi, Harkness, & Silva, 1993), which means that not all teaching procedures are capable of positive influence on important core cognitive skills. It should be noted also that the rise in IQ scores for children in Cassidy et al. were shown to correlate with the increased fluency in DRR subsequent to the teaching procedure. The findings by Cassidy et al. were also predicted by preliminary research with typically-developing adults that demonstrated correlations between high level relational responding skills and higher IQ scores (O'Toole & Barnes-Holmes, 2009; O'Hora, Peláez, Barnes-Holmes, & Amnesty, 2005; O'Hora et al., 2008).

In line with the paradigm that relational skills may be fundamental to advanced cognitive skills, the current study aimed to establish fluent relational responding with children with autism. To facilitate this, an objective was to adapt a computerised procedure known as the Implicit Relational Assessment Procedure (IRAP), more commonly used in behavioral studies of cognition to detect implicit bias in a number of socially sensitive areas (Barnes-Holmes et al., 2006). In the current context the acronym T-IRAP ("T" for "Teaching") is used to distinguish the teaching program from the IRAP. The use of computerised interactive teaching and 'teaching machines' is by no means a new concept in behavior analysis (Skinner, 1958) and the current study aimed to examine if the facility for rapid presentation of trials and automatic data recording afforded by the T-IRAP might have utility for teaching relational responding with participants with diagnosed autism. The IRAP software program is freely available online (http://irapresearch.org/downloads-and-training/), and the current research may encourage behavioral researchers and practitioners to view it as a useful resource for teaching a variety of relational responding

skills. The use of sample stimuli, target words and relational terms in the T-IRAP can be altered depending on the subject matter being tested and on the ability of the individual, and images and or words may be incorporated. The immediacy and consistency of the application of consequences has long been reported as important in learning (Lovaas, 1987; Pierce, Hanford & Zimmerman, 1972), and thus automated procedures may provide an advantage in this regard in addition to that of speeding up trial presentations and trial completions. The T-IRAP could provide consequences in that correct responses result in trials proceeding, whereas incorrect responses present a red "X", and trials cannot proceed until the participant makes a correct response. The T-IRAP also provides onscreen information regarding speed and accuracy of responding subsequent to trial-blocks; therefore students could be taught to establish personal targets based on previous responding, and to graph their results to see their ongoing learning accomplishments. This could facilitate competing with self rather than others, which has been found to encourage learning progress in Precision Teaching (PT). Throughout the T-IRAP procedure the learner can respond at his or her own pace, and the teacher can avoid impeding learning through, for example, poor manipulation of material. As Binder (1996) pointed out, a large proportion of instructional time in trial procedures may be taken up with slow presentation of stimuli, delivery of consequences and recording of results. It should be noted that the T-IRAP is not proposed as an alternative or replacement to Table-Top TT procedures because this would not be ecologically valid, but it may be that the T-IRAP could be a useful and efficient resource in certain circumstances as an additional teaching tool that does not require the presence of a teacher on a one-to-one basis.

Research questions for the present study were as follows: Could the interactive computerised T-IRAP program be adapted to teach relational responding to children with autism? Would participants require pretraining to engage appropriately with the T-IRAP, and was effective pretraining possible? Other aims were to compare participants' fluency (speed and accuracy) in relational responding during TT and T-IRAP teaching, to determine if performance on relational learning tasks were impacted with the introduction of the T-IRAP. The relational 'frames' targeted were coordination (SAME/DIFFERENT), comparison (MORE/LESS), opposition, and derived relational responding. Possible outcomes were as follows: If the T-IRAP could be successfully adapted to teach relational responding this might support use as a supplementary teaching tool to enhance relational learning for students lagging behind peers, particularly if a learning advantage in terms of speed and/or accuracy was demonstrated. Alternatively, if the T-IRAP had no positive effect but relational learning speed and accuracy data remained stable, this might support the use of the T-IRAP as a convenient utility tool for maintaining responding (that doesn't require one-to-one teaching). Another possible alternative was that the T-IRAP would show a detrimental effect on relational learning; a decrease in either or both of speed and accuracy would undermine potential utility as a teaching tool A series of three research studies was designed to answer the above research questions. The relational repertoires thought to be more basic or fundamental to more complex relations were targeted initially with four participants; for example, coordination relations and relations with a physical basis were targeted before relations that were arbitrarily designated within the research context (see Hayes et al., 2001). This was in order to gradually build complexity in participants' relational repertoires. An adaptation of a multiple baseline design across participants was used to compare effects of teaching procedures, and this commenced with TT teaching with all participants simultaneously; the T-IRAP was introduced at staggered time intervals to determine any immediate effect on either (or both) of accuracy or speed of participants' relational responding across three studies.

Study 1: Same/different relations

Research commenced with Study 1 which targeted coordination relations (SAME/DIFFERENT) with four participants diagnosed with autism spectrum disorder. Participants were initially exposed to a T-IRAP pretest to determine if they could engage with the computerised program. If they could not, a pretraining procedure was designed to establish the prerequisite skills of pressing keys on the keyboard to correspond with onscreen response options. Subsequent to successful completion of the T-IRAP prestest, a variation of a multiple baseline design across participants was used to compare learning in relational responding during TT and T-IRAP procedures across the four participants. The TT teaching procedures were commenced with all participants simultaneously and the accuracy and trial-block duration data (interpreted as speed of responding) were manually recorded for use as a comparison for similar data automatically recorded during the T-IRAP which was subsequently introduced on a staggered basis across four participants. Nonarbitrary SAME/DIFFERENT were targeted with both procedures prior to more complex arbitrary relational coordination skills. When arbitrary relational skills were targeted with four participants an adapted multiple baseline design was again used and commenced with TT teaching followed by the staggered introduction of the T-IRAP teaching program.

» METHOD

Participants

Four children, three boys and one girl aged 8–10 years, were recruited from an ABA school in Ireland. All participants had been previously diagnosed with autism by a clinical psychologist independent of the current research. Clinical diagnoses were based on criteria in the *Diagnostic and Statistical Manual (Fourth Edition)* (DSM-IV), and the severity was described as within the mild to moderate range for all four participants. All participants had normal or corrected-to-normal vision. All participants had verbal repertoires that included verbal operants (Skinner, 1957) such as manding, tacting, intraverbals, autoclitics and textuals (reading via word recognition).

To avoid a possible photosensitive reaction to the PC screen, parents were advised that children with a history of seizures should be excluded as participants. In addition to formal parental consent, verbal assent was sought from each child before commencing each session. The Investigator worked at the school and was trained in the principles and application of ABA, and was therefore compe-

tent to work with participants, who were provided with frequent short breaks and positive reinforcement throughout procedures. Children were appropriately supervised and monitored throughout the procedures in accordance with usual ABA teaching regimes used at the school, and all procedures were conducted with the consent and supervision of the school Educational Director. The Investigator was known to all participants, and prior to commencing the children were asked if they would like to work with the Investigator on a computer program or if they would prefer to work with another teacher doing other school work. Participants were free to respond by opting to work with the Investigator or continuing with other school work. Participation was conducted on an individual basis, and the Investigator was present with each child throughout all T-IRAP procedures. Procedures were to be terminated if children showed signs of distress. Physical indicators of distress were defined as increased stereotypy or other problem behavior, or verbalised dislike of procedures, or excessive frowning or yawning. None of the children had been previously exposed to a T-IRAP procedure and all were considered naïve in this regard. None of the children showed signs of distress or expressed a wish to end the T-IRAP procedures throughout the study.

Setting

All aspects of the study were conducted in a quiet room in the participants' school with the Investigator present at all times. Sessions were conducted during school hours, usually twice per week. Duration of individual sessions was never more than 20 mins. when teaching children how to use the T-IRAP initially, and never more than 30 mins. when teaching relational skills. The longer duration of teaching sessions was considered justifiable because the educational targets accorded with those in the children's Individualised Educational Program and the teaching schedules for these.

Apparatus and materials

T-IRAP. The IRAP is a computer program written in Visual Basic (Version 6.0.) that controls all aspects of stimulus presentation and the recording of all responses on a Dell computer. The T-IRAP program was adapted from this and designed so that each trial presented a sample stimulus, a comparison stimulus, and two relational terms (e.g., SAME/DIFFERENT response options). Participants responded by pressing a key on the computer keyboard (e.g., 'd' to select SAME, 'k' to select DIFFERENT). All visual pictorial stimuli were sourced via the internet or education software containing catalogues of images (for example *Boardmaker*™). The program recorded correct and incorrect responding, and response latencies (time between trial presentation and participants' response) in milliseconds. Latency data were averaged across trial-blocks to provide trial-block duration data which was interpreted as speed of responding.

Table-top materials. Laminated card 6 cm × 9 cm with words (SAME and DIFFERENT) printed clearly in black font (48 pt.) on a white background were used. Laminated card 6 cm × 9 cm with pictorial stimuli similar to those used in the T-IRAP were also used. A stop-watch was used to time trial-block duration throughout TT teaching, and data were recorded on sheets designed for the purpose.

Interobserver data

All T-IRAP programs throughout the current series of studies recorded duration of trial-blocks (averaged response latency) and accuracy data (percentage correct) automatically. During TT teaching, an independent observer recorded data for accuracy (percentage correct) and speed (duration of trial-blocks) for approximately 20% of all training trials, and these data were compared with data recorded by the Investigator for agreement. Agreement was calculated by dividing the total number of agreements by the number of disagreements plus agreements and converting to a percentage. Agreement for accuracy data was calculated at a mean of 95% (range, 92% to 100%) and mean agreement for trial duration data was 98% (range, 96% to 100%). It should be noted also that a high proportion of the TT trial data throughout the current series of studies were recorded by independent ABA instructors (assistant instructors working in the school) who were 'blind' to the purpose of the research. These IOA details pertain to all three studies in the current series.

Experimental design

The computer program used was the IRAP, which is freely available online (http://irapresearch.org/downloads-and-training/), and the adapted program is referred to in the current text as the T-IRAP (teaching IRAP). It should be emphasised that the training components were conveniently adapted for teaching relational responding, and that the current research involved no aspect of examining responding for implicit bias related to any phenomenon.

A variation of the multiple baseline design across participants was used to compare the T-IRAP with TT teaching in terms of speed and accuracy of relational learning with four children with autism. The experimental design did not involve an initial "no intervention" or "baseline" condition. Instead, the first phase commenced concurrently for each of the four participants with a TT teaching procedure, and both accuracy and speed of relational responding during trials was recorded by the investigator (or other independent instructors) using a stopwatch, paper and pencil. This is customary at the school at which the research was conducted, which routinely implements Precision Teaching practices. Data were collected for four participants across a minimum of 5 trial blocks in order to provide information about participant learning in the TT condition. The T-IRAP was then introduced with one participant while the TT procedure was extended with the other three participants. The interactive computerised T-IRAP was subsequently introduced at staggered time intervals across the three remaining participants (after 10, 15, and 20 trial-blocks, respectively). The TT speed and accuracy data for participants' relational learning were used to compare with similar data recorded automatically during the T-IRAP procedure. The staggered introduction was designed to facilitate an examination of any immediate effect on speed and accuracy in relational responding evident upon the introduction of the T-IRAP. If an immediate effect was demonstrated and replicated across participants it would seem less likely to be a result of extraneous variables.

The aim was to determine if the T-IRAP might be useful as a supplementary teaching tool to increase accuracy or speed in relational responding, or alternatively if T-IRAP teaching had no

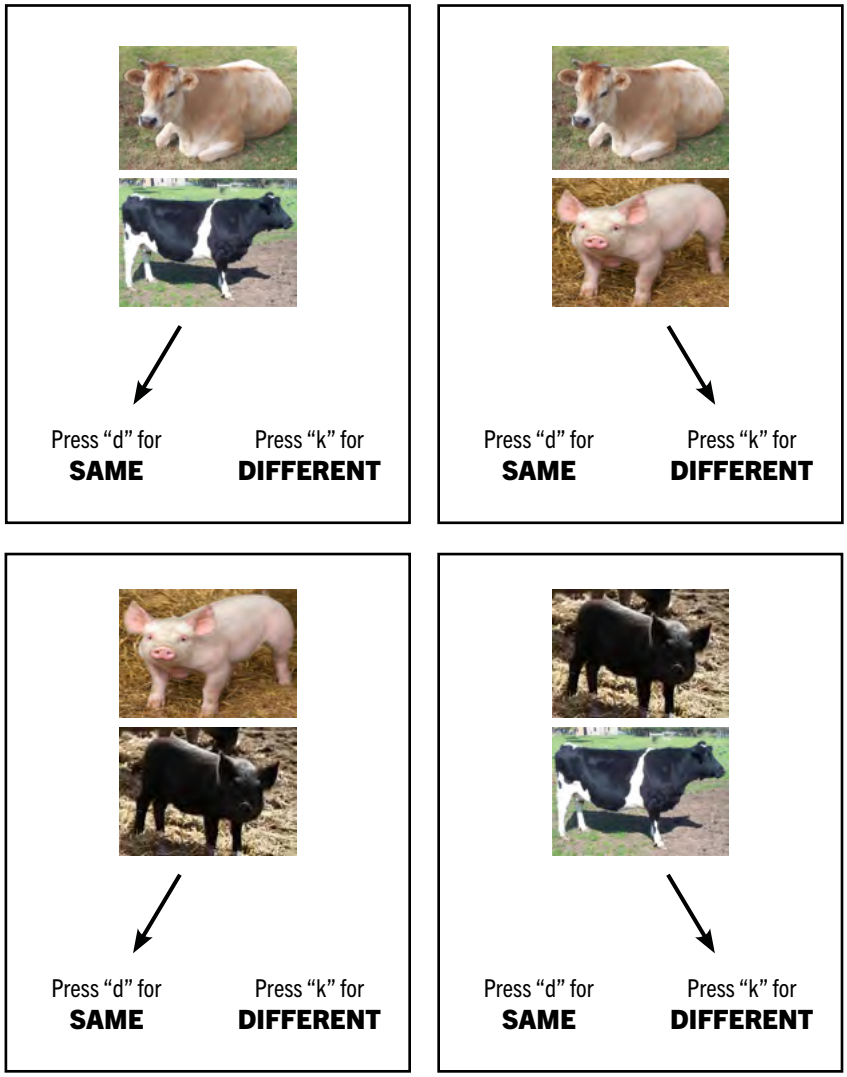


Figure 1. Trial presentation format for SAME/DIFFERENT relational responding with nonarbitrary stimuli.

positive effect on relational responding, but that the data remained stable (which might suggest T-IRAP as a convenient utility tool for maintaining responding), or if T-IRAP had a detrimental effect on relational responding in terms of either accuracy or speed, or both.

Procedure

T-IRAP pretesting. Pretesting was conducted in order to determine if the participants could engage with the T-IRAP interactive computerised teaching program; for example, if they could understand that the response options SAME/DIFFERENT on the computer screen corresponded with designated keys on the keyboard ('d' and 'k', respectively). Children were given instructions to the following effect:

> *We're going to do some work on the computer. We will see things that are the same and things that are different. If the two pictures are the same, press the 'd' key for Same. If the two pictures are different, press the 'k' key for Different. So, for example, if a picture of a tree comes up here (pointing to top picture) and a picture of a tree comes up here (pointing to bottom picture) I will point here (pointing to the onscreen prompt 'press d for Same') and you should press the 'd' key (pointing to the letter on the keyboard) because the pictures are the same. If a picture of a tree and of a ball comes up on the screen I will point here 'press k for Different' and you should press 'k' (pointing to the letter on the keyboard) because they are both different. If you get it right more pictures will come up. If you get it wrong a red × will come up, but that's ok, we can try again to get the next one right.*

Thus, when the T-IRAP pretest was commenced, each child had to respond by pressing 'd' on the keyboard to select the onscreen response option SAME, and by pressing 'k' to select DIFFERENT. If the child pressed the correct key, for example, 'd' when the two stimuli presented onscreen were identical and the Investigator said "Press the key for 'same', the screen cleared and the next trial was presented, and the Investigator delivered contingent positive reinforcement (token economy on a fixed ratio schedule [FRI]; social praise on a variable ratio schedule [VR 3]). If the child pressed no key on the keyboard or pressed the wrong key, the researcher pressed the correct key and provided corrective feedback (e.g., "Press this one, because they're the same", while pressing the correct key). The pretest had a success criterion of a minimum of 8/10 correct trials. The aim was simply to determine if children could engage appropriately with the T-IRAP program. If a child was unable to meet the T-IRAP pretest criterion, TT pre-training was commenced to teach correspondence between the response options SAME/DIFFERENT and the letters 'd' and 'k', respectively. When all participants successfully completed the pretest, the experiment proper commenced.

Pretraining

Pretraining involved a TT procedure to teach correspondence between the response options SAME and DIFFERENT, and the letters 'd' and 'k', respectively. Two laminated cards with the printed words SAME and DIFFERENT were placed on the table in front of the child, and laminated cards with the printed letters 'd' and 'k' were used also. The Investigator handed the child either the letter 'd' or 'k' and instructed the child to match with either SAME or DIFFERENT as appropriate. The Investigator provided a verbal and gestural prompt by pointing to the correct option and saying, for example, " 'd' goes with SAME" when handing the letter 'd' to the child to match with the response option SAME. The verbal and gestural prompts were provided for the first two trials only, and subsequent trials required the participant to independently and correctly match the letter with the word assigned. Positive reinforcement was delivered contingent upon participants matching 'd' to SAME and 'k' to DIFFERENT (token economy on a fixed ratio schedule [FRI]; social praise on a variable ratio schedule [VR 3]). For incorrect responses, the Investigator provided verbal feedback and a gestural prompt

indicating the designated correct response option. Social positive reinforcement for attempting a correct response was also provided (e.g., "Good trying, let's try again"). If a participant showed 100% correct across 3 trial-blocks for correspondence pretraining they were subsequently re-exposed to the pretest for the T-IRAP to determine if they could now select 'd' or 'k' on the keyboard to correspond with the correct onscreen response option. If the child again failed the pretest, he or she would return to the TT pretraining procedure for an additional block of 10 pretraining trials before returning to the T-IRAP pretest (this was not found to be necessary for any participant). SAME/DIFFERENT picture stimuli presented during T-IRAP pretesting were not used in subsequent relational training procedures.

Table-top: SAME/DIFFERENT nonarbitrary relations

When all participants had successfully completed the pretest, they proceeded to the experiment proper, which commenced with TT teaching for SAME/DIFFERENT relations. Learning SAME/DIFFERENT relations is important in itself, and it may provide a foundational basis for learning more complex relational responding (Hayes et al., 2001). The SAME/DIFFERENT relations taught first were nonarbitrary and based on physical similarity or difference. The TT procedure was commenced with the four participants simultaneously on the same day and data in this phase were collected using an adaptation of a multiple baseline design across participants. During the TT procedure laminated cards (6 cm × 9 cm) with pictures and printed words were placed on the desk in front of the child, in a format similar to that to be used during the T-IRAP program (see Figure 1). The Investigator placed a sample stimulus (e.g., picture of a cow) above a single comparison (e.g., an identical picture of a cow, or else a picture of something different such as a ball), with the printed words SAME and DIFFERENT placed below the pictures. The Investigator instructed each child to select the correct response, SAME or DIFFERENT when presented with the first trial. Positive reinforcement was delivered contingent upon correct responding and corrective feedback was provided for incorrect responding. Positive reinforcement involved token economy systems with tokens delivered contingent upon accurate and speedy responding (e.g., token economy with VR 3 schedule for accurate responding, FR1 for increased speed indicated by trial-block duration data). Reinforcement schedules were arranged on an individual basis for each participant and delivery of contingent reinforcement was kept constant for each participant across both TT and T-IRAP conditions. A criterion level for accuracy in relational responding was preset at 3 trial-blocks × 100% correct. This criterion was used throughout teaching procedures because it is commonly used in the school in which the research was conducted and thus was familiar to Instructors.

T-IRAP: SAME/DIFFERENT nonarbitrary relations

The initial TT phase for SAME/DIFFERENT nonarbitrary relations was continued across 5 trial blocks (10 trials in each trial-block) with all four participants, at which point the T-IRAP was introduced with one participant. The TT phase was extended for three other participants, and the T-IRAP was introduced at staggered time intervals (e.g., after 10, 15, and 20 trial-blocks, respectively) to discover any immediate effect on the accuracy and/or duration data for relational learning across participants. The T-IRAP trial-blocks consisted of 10 trials teaching SAME/DIFFERENT relations and these operated similarly as described for the T-IRAP pretest, except that the stimuli used were novel and the Investigator did not point to the correct onscreen prompt as in pretest trials. The Investigator delivered similar instructions as per the pretest and added: "Go fast, but try to get it right".

General T-IRAP format

Stimuli presented onscreen during programs consisted of pictorial images as sample and comparison stimuli (e.g., dog and dog; dog and cow), and printed words presented as relational response options (e.g., SAME/DIFFERENT). During all trials in all T-IRAP teaching programs, a correct response (selecting the key that corresponded with the correct onscreen response option) was immediately followed by the screen clearing and presentation of the next trial. An incorrect response (selecting the key corresponding to the incorrect onscreen response option) was followed by a red 'x' presented onscreen, and participants then had to select the correct response option before the screen would clear the screen and present the next trial. Because the children were not familiar with the red x to indicate an incorrect response, the Investigator initially provided additional verbal feedback also (e.g., "nice try but you should select this one" while pointing to the correct stimulus). Throughout all T-IRAP and TT teaching the Investigator delivered positive reinforcement contingent upon accurate and speedy responding (e.g., token economy with VR 3 schedule for accurate responding, FR1 for increased speed indicated by trial-block duration data). Corrective feedback was delivered for incorrect responding. The schedules of reinforcement were always arranged in accordance with the individual child's current level of responding.

All the T-IRAP programs measured and recorded response latency data and percentage of correct responses for each participant across each session. Response latency data were averaged for each trial-block and this provided a measure of duration which was taken to indicate speed of participant responding; the T-IRAP presents onscreen speed and accuracy data at the end of each session. Right and left positions of response option stimuli were not counterbalanced across trials during any of the procedures during Study 1. This was because other studies have shown that including such counterbalancing of stimuli in initial learning can impede learning progress for children with autism (Smeets & Striefel, 1994). Although the aim was ultimately to include counterbalancing of stimuli to enhance fluent relational learning, the added complexity of counterbalancing of position of response options was only introduced in the T-IRAP subsequent to Study 1 after participants had learned SAME/DIFFERENT relational frames. Counterbalancing of response options was not used with any TT teaching procedures throughout the current research because the Instructor would have to physically manipulate position in addition to presenting stimuli and recording data manually and this would likely have impacted quite negatively on speed of responding.

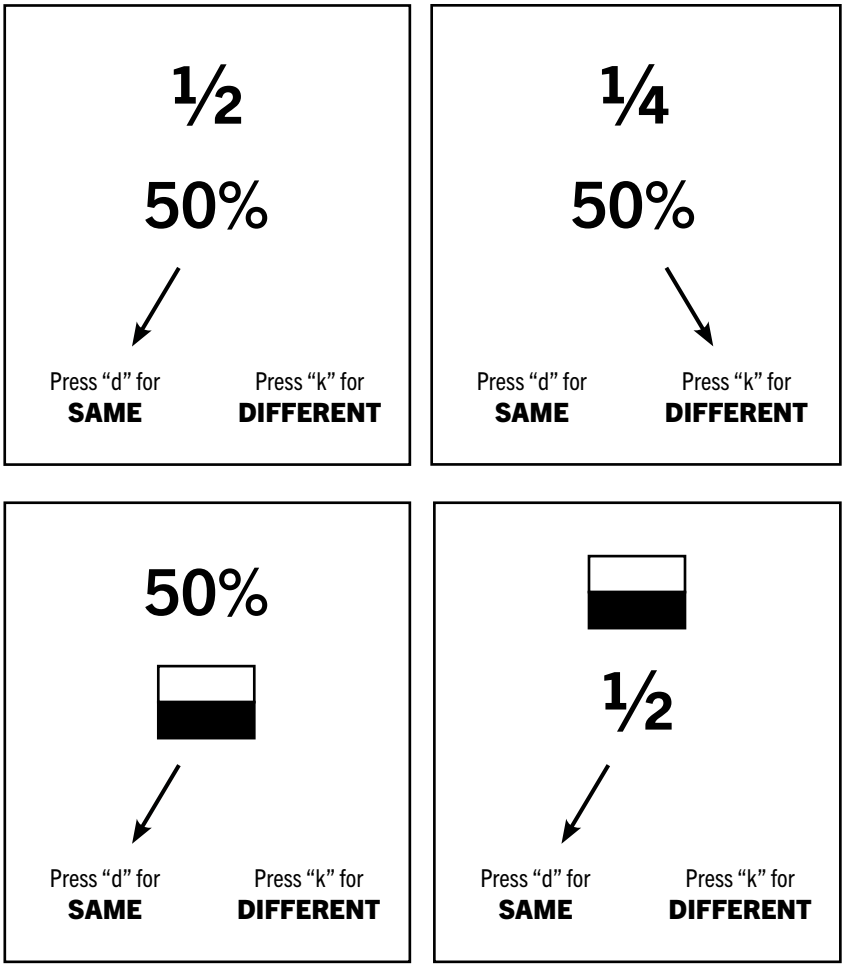


Figure 2. Trial presentation format for SAME/DIFFERENT relational responding with arbitrary stimuli.

Table-top: SAME/DIFFERENT arbitrary relations

Study 1 aimed to show that arbitrary stimulus relations frequently used in educational and real-world settings could be taught with four participants using the T-IRAP format to facilitate accurate and speedy responding. Thus, arbitrary SAME/DIFFERENT relational responding involved teaching children to relate as 'SAME', the numerical symbol for half (½) with the percentage symbol (50%), and then to relate the percentage symbol to a visual graphic representation of half (see Figure 2). When a symbol such as that for a quarter was presented with a symbol for half, the children were taught to select the response option 'DIFFERENT'.

To compare learning data (speed and accuracy) for TT with those for T-IRAP, a variation of the multiple baseline design across four participants was again used. The procedure commenced with TT teaching, and stimuli were presented on the table in front of each participant in a similar format as before (e.g., sample stimulus on top [e.g., ½], comparison below this [e.g., 50% for a SAME trial, 25% for a DIFFERENT trial], and two printed response options SAME/DIFFERENT below the sample stimuli. The presentation format and positioning of stimuli for TT and for the T-IRAP program was similar. When commencing TT teaching for arbitrary SAME/DIFFERENT relational responding with four participants, the Investigator prompted each child to select the correct response during the first few (3 or 4) trials. Specifically, when trials presented two symbols for half the Investigator said "Point to same" using a gestural prompt to indicate the SAME response option, and when trials presented a symbol for half and a symbol for quarter the Investigator said "Point to different" and used a gestural prompt to indicate the DIFFERENT response option. The prompts were faded after initial trials. Positive reinforcement and corrective feedback procedures were conducted similarly as described previously. The T-IRAP for arbitrary relational responding was gradually introduced across the four participants in a stepwise fashion when participants had completed sufficient TT trial-blocks to provide data for comparison (after 5, 10, 15, 20 trial-blocks).

T-IRAP: SAME/DIFFERENT arbitrary relations

Procedures operated similarly as for the nonarbitrary SAME/DIFFERENT relations, except that the nonarbitrary pictorial stimuli used previously were replaced with arbitrary stimuli.

» RESULTS AND DISCUSSION

Pretest and pre-training procedure

Three of the four participants (Conor, Niamh and Nicholas) failed to achieve a minimum of 8/10 correct responses during the T-IRAP pretest, and therefore these participants completed pretraining in order to teach correspondence between response options onscreen and keys on the computer keyboard. One participant, Robert, successfully completed the pretest on the first occasion. The data for pretraining for three participants to establish pre-requisite T-IRAP skills indicate that they succeeded in learning the necessary correspondence (see Figure 3). Subsequently the three participants successfully completed a repeated pretest.

SAME/DIFFERENT nonarbitrary relations

The data for four participants learning SAME/DIFFERENT relational responding during TT and T-IRAP are presented using a multiple baseline graph (Figure 4). Accuracy data are depicted using a solid line, and data for duration of trial-blocks (speed of responding) are shown with a broken line. Accuracy data points indicate the percent of correct trials and relate to the *y* value axis labelled Percentage Correct. Duration data points represent the time taken in seconds to complete a trial-block, and relate to an additional value axis on the right side of the graph, time-scaled in seconds. Criterion levels for accuracy (percentage correct) throughout teaching procedures was pre-set at 100% × 3 trial-blocks, and no criterion was pre-set for duration data (speed of responding).

Robert's data across 5 trial-blocks (Figure 4, top panel) indicate that he readily acquired SAME/DIFFERENT nonarbitrary relational skills during TT teaching and achieved a criterion performance (100% × 3 trial-blocks). Trial-block duration data for Robert across TT teaching show a steady decreasing trend, indicating that speed

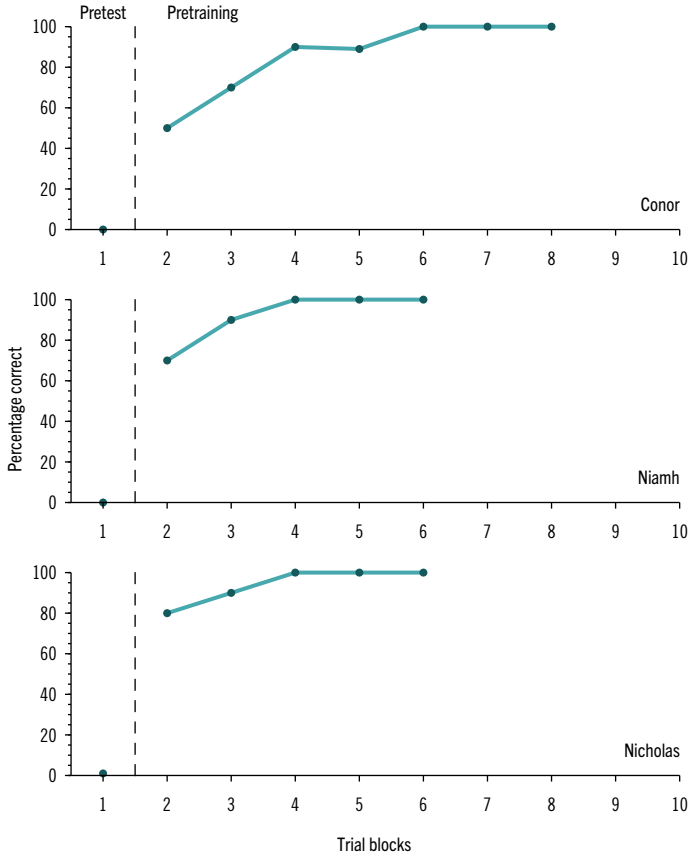


Figure 3. Pretraining data for three participants

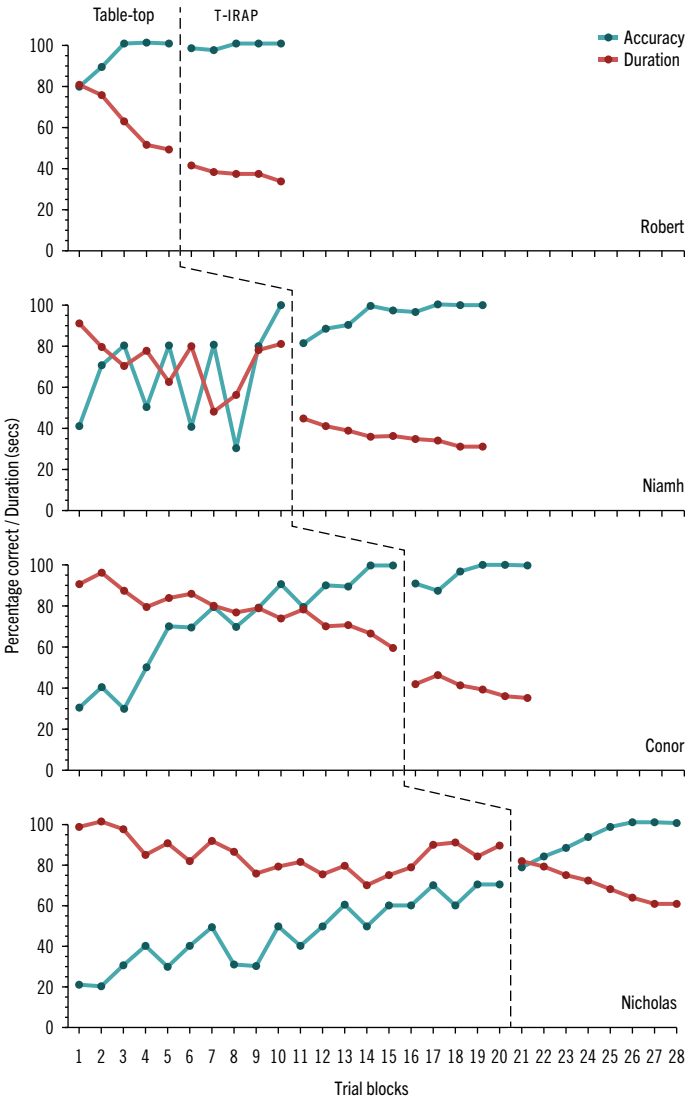
of responding increased. When the T-IRAP teaching program was introduced subsequent to 5 trial-blocks, accuracy data initially dipped marginally and then rapidly returned to criterion levels. Duration data showed that the trend toward faster responding continued throughout 5 T-IRAP trial-blocks.

The SAME/DIFFERENT nonarbitrary relational data for Niamh (Figure 4, second panel) during TT teaching were extended across a total of 10 trial-blocks. Accuracy data were very variable during TT teaching, but the tenth trial-block showed a rise in accuracy. The duration data for SAME/DIFFERENT relational responding for Niamh during TT teaching were also variable and showed no trend. Initially, when the T-IRAP program was commenced with Niamh, the accuracy data dipped slightly but returned rapidly to high levels and remained stable at high levels; there was an immediate and substantial decrease in the level of duration data evident when T-IRAP teaching commenced, indicating speedier responding. Duration data throughout T-IRAP teaching for Niamh continued to descend across a total of 9 T-IRAP trial-blocks (when Niamh's responding met the accuracy criterion level).

The data for SAME/DIFFERENT nonarbitrary relational responding for Conor (Figure 4, third panel) were extended across 15 trial-blocks during TT teaching, and accuracy data throughout showed a steady ascending trend and almost reached criterion levels. Duration data showed a descending trend toward speedier responding during TT teaching. Accurate responding initially decreased slightly when the T-IRAP was introduced with Conor, but recovered again fairly rapidly and ascended to the criterion levels. Data representing speed of responding during T-IRAP trial-blocks showed an immediate drop in level (time taken to complete trial-blocks), and the descending trend in duration data continued throughout the 6 T-IRAP trial-blocks at which point the learning criterion was achieved.

For the fourth participant, Nicholas (Figure 4, bottom panel), the TT teaching procedure was continued across 20 trial-blocks. Accuracy data were somewhat variable with an ascending trend evident. Duration data for Nicholas during the 20 TT trial-blocks showed some variability and a weak descending trend. When the T-IRAP was introduced with Nicholas the variability in accuracy data was eliminated and the ascending trend was continued to criterion levels across 8 trial-blocks. Duration data during T-IRAP teaching also became more stable and showed a steadily decreasing trend. Thus, responding became increasingly more accurate and rapid in the T-IRAP teaching procedure compared with TT teaching for Nicholas.

Figure 4. Nonarbitrary SAME/DIFFERENT relational data for four participants in TT and T-IRAP teaching conditions



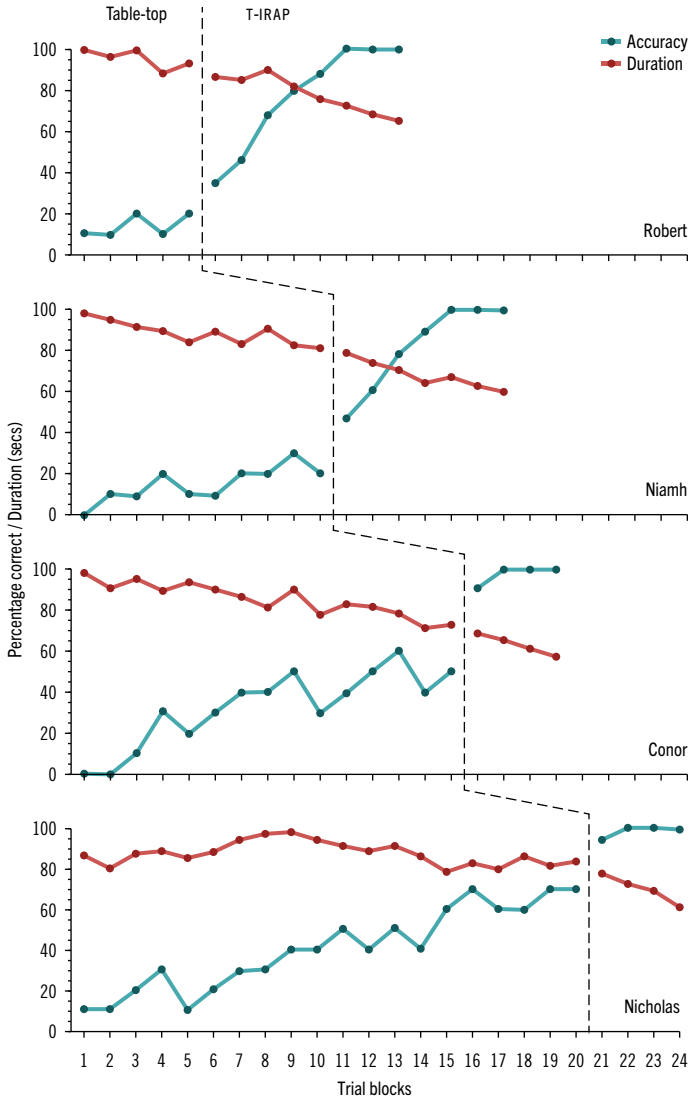


Figure 5. Arbitrary SAME/DIFFERENT relational data for four participants in TT and T-IRAP teaching conditions

SAME/DIFFERENT arbitrary relations

The relational data for Robert (Figure 5, top panel) show that across five trial-blocks during the Table-Top procedure Robert began to acquire the SAME/DIFFERENT arbitrary relational responding, and accuracy levels were slowly ascending when the T-IRAP was commenced. Duration data during the TT procedure showed no discernable trend across TT teaching. During T-IRAP trials, accuracy immediately increased and ascended to the criterion level across 6 trial-blocks. Duration data showed a steadily descending trend indicating that speed of responding increased during T-IRAP teaching.

The accuracy data for Niamh (Figure 5, second panel) showed a steadily accelerating trend of accurate responding during the 10 trial-blocks in which the TT procedure was conducted. Duration data were a little variable but with a slightly downward trend during TT teaching. When the T-IRAP program was commenced with Niamh, the ascending trend in accuracy became immediately steeper and data rose to criterion levels across 6 T-IRAP trial-blocks. Duration data throughout T-IRAP teaching showed a steady gradual decrease indicating more rapid responding.

Accuracy data for Conor (Figure 5, third panel) during TT teaching show a steady but somewhat slowly ascending trend across a total of 15 trial-blocks. Duration data during TT teaching are slowly descending indicating Conor is gradually gaining speed in relational responding. When the T-IRAP was introduced with Conor the accuracy data indicated an immediate jump to higher levels and these data remained stable at the criterion level across 4 trial-blocks. There was also quite a pronounced immediate decrease in levels of duration data, and these proceeded in a steady downward trend, indicating speedier responding during T-IRAP teaching.

The accuracy data for Nicholas (Figure 5, bottom panel) showed a very gradual ascent across 20 trial-blocks, and almost rose to criterion level. Duration data showed some little variability across the 20 trial-blocks but overall the trend was flat indicating that speed of responding was not increasing for Nicholas during TT teaching for SAME/DIFFERENT arbitrary relations. During T-IRAP trials Nicholas' accuracy data remained stable at high levels and met the accuracy criterion after 4 trial-blocks. There was an immediate drop evident in the levels of duration data when the T-IRAP was introduced, and these data continued in a steady descending trend indicating that speed of relational responding was increasing.

In summary, results in Study 1 showed that it was possible to adapt the interactive T-IRAP computerised program to teach SAME/DIFFERENT relational frames, both nonarbitrary (physically-based) and arbitrary, with four participants diagnosed with autism. Three children required brief pretraining to establish correspondence between relevant keys on the computer keyboard and onscreen response options. The staggered introduction of the T-IRAP after participants had completed several TT trial-blocks was used to compare relational learning data for four participants in terms of speed and accuracy levels attained during both teaching procedures. The TT method was successful in increasing speed and accuracy, however, results showed more rapid gains in accuracy during T-IRAP teaching for all four participants during SAME/DIFFERENT relational responding, and the effect was apparent with both nonarbitrary and arbitrary coordination relations. The downward trend evident in the TT duration data (indicating increasing speed of responding) continued during T-IRAP teaching for three participants; for the fourth participant (Nicholas) the duration data had remained relatively flat across numerous TT trial-blocks, but began to show a downward trend when T-IRAP teaching was introduced.

Study 2: Comparative more/less relational responding

Study 1 targeted the relational frame of coordination (SAME/DIFFERENT) relations, because these are likely the earliest type of relation learned by children and may be foundational to more complex relational responding such as comparative, OPPOSITIONAL, hierarchical, or analogy relations (Hayes et al., 2001). The aim in Study 2 was to extend the findings that the T-IRAP could be used to teach relational responding, this time targeting comparative (MORE/LESS) relations, first nonarbitrary and then arbitrary, with the four participants diagnosed with autism who participated in Study 1. Study 2 also compared relational learning outcomes

for the four participants across TT teaching and interactive computerised T-IRAP teaching. As in Study 1, an adapted multiple baseline design across participants was used and four participants simultaneously commenced learning MORE/LESS nonarbitrary relations in TT teaching conditions. The T-IRAP program was subsequently introduced stepwise at time intervals across participants, when considerable accuracy and duration data had been collected for TT teaching (after 5, 10, 15, 20 trial blocks). Nonarbitrary comparative relations in Study 2 meant that participants were taught MORE/LESS relations based on the physical size of stimuli; for example, pictorial stimuli were used depicting greater and smaller piles of items. Arbitrary MORE/LESS relations were subsequently taught with four participants, and this involved pictorial stimuli of coins that have been assigned greater/lesser value by the wider social community (see Figure 6). The MORE/LESS relations in this case are arbitrary in that the comparative relation does not correspond to physical dimensions of the stimuli; for example, the 1Euro coin is a smaller coin than the coin which is half the value, the 50 cent coin. As in Study 1, it was not considered necessary to use novel or laboratory type stimuli for teaching arbitrary relations because the current research is applied. It was considered more practically useful for participants to learn arbitrary relations between coins used as local currency.

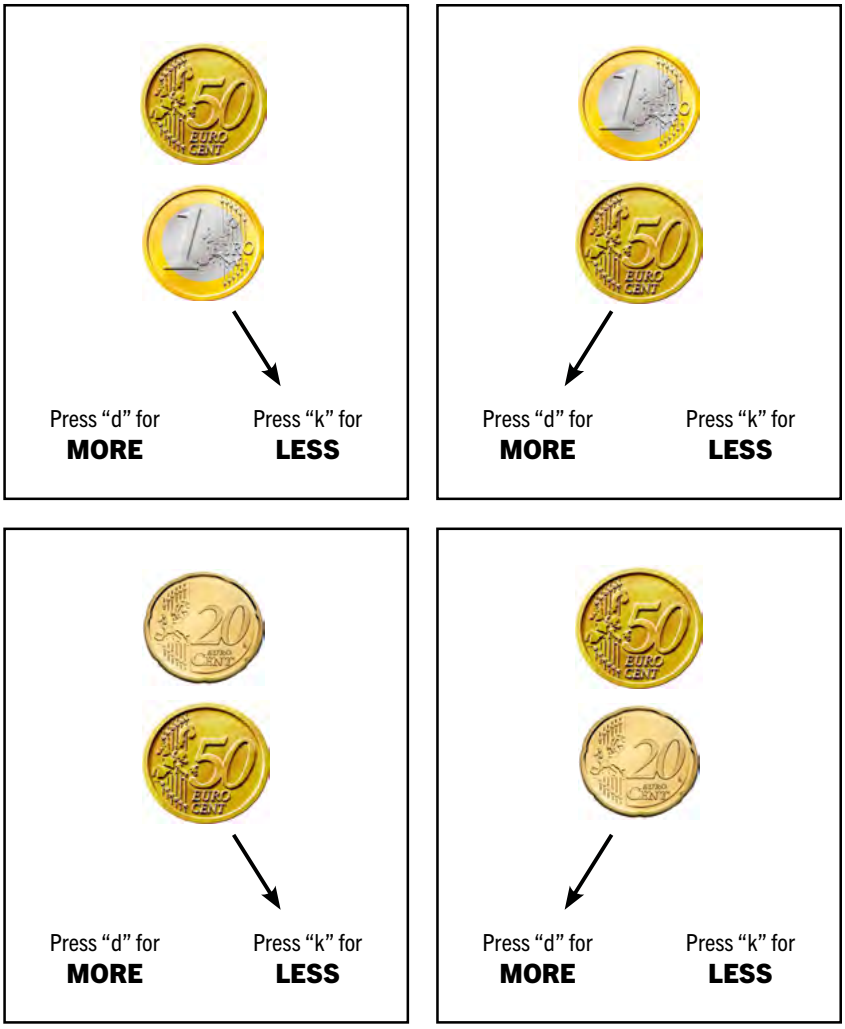


Figure 6. Trial presentation format for MORE/LESS relational responding with arbitrary stimuli

As before, teaching procedures were compared with regard to participants' relational learning outcomes in terms of recorded accuracy and trial-block duration data for each participant learning comparative nonarbitrary and arbitrary relational responding. If an effect on accuracy or speed of relational responding was found with one participant when the T-IRAP was introduced, replication of effects across participants when the T-IRAP was introduced would provide strong support for the latter as an effective and useful teaching tool that could complement TT teaching procedures, particularly for children who might benefit from extended practice.

An additional aim in Study 2 was to counterbalance position of response option stimuli during the T-IRAP teaching procedures, as this might facilitate participants' in acquiring flexibility in relational skills. (The left/right positions were kept constant in Study 1 to facilitate students in learning initial relational responding skills.) Position of response options was held constant throughout TT teaching during Study 2, however, because it was felt that manual manipulation of position of stimuli, in addition to manual presentation and data recording, might result in an impediment to the speed of participant responding, making a comparison of teaching procedures somewhat futile. The learning criterion for accuracy levels in Study 2 was similar to that in Study 1 and required 100% across three trial-blocks.

» METHOD

Participants

Participants were the same as in Study 1. The setting was the children's school classroom, also as per Study 1, and there were no additional ethical issues relevant to Study 2.

Apparatus and materials

(See also general details described in Study 1). The T-IRAP program trials for comparative relational responding presented a sample stimulus, a comparison stimulus, and two relational terms (e.g., MORE/LESS). Pictorial stimuli such as images with small and large piles of objects were used for nonarbitrary comparative relational responding trials. Pictorial stimuli for arbitrary relational responding involved images of European coins of differing value, such as a 1 Euro coin, 50cent coin, 20cent coin (Figure 6). All visual stimuli used in the T-IRAP program were sourced via the internet or education software containing catalogues of images (for example *Boardmaker*™). As before, participants were required to select a response option by pressing a key on the computer keyboard (either 'd' or 'k'). The facility to use counterbalancing available in the T-IRAP program was utilised in Study 2, and left/

right positioning of the response options was counterbalanced throughout all T-IRAP trial-blocks. The computerised program automatically recorded correct and incorrect responding in addition to overall duration of trial-blocks in milliseconds (averaged response latencies for each trial-block).

Table-top materials. Two laminated cards 6 cm × 9 cm with response options 'MORE' or 'LESS' printed in black (48 pt. font) on white background. Laminated card 6 cm × 9 cm with pictorial stimuli similar to those used in the T-IRAP (e.g., depicting greater and lesser piles of objects [nonarbitrary relations]; depicting euro coins of differing value [arbitrary relations]).

Procedure

Table-top: MORE/LESS nonarbitrary relations. MORE/LESS nonarbitrary relational teaching was commenced simultaneously with four participants with diagnosed autism, and a multiple baseline design was adapted to compare TT teaching with a T-IRAP interactive computerised program to determine which teaching method produced best relational learning outcomes (in terms of accuracy and speed of responding) across four participants. As in Study 1, the teaching was commenced in TT conditions with all participants, and the T-IRAP was gradually introduced first with Robert after 5 trial-blocks. The T-IRAP was then introduced at staggered time intervals across the other three participants who meanwhile continued extended trial-blocks in TT conditions (completing 10, 15, 20 trial-blocks, respectively) to provide sufficient data to facilitate a comparison of TT and T-IRAP procedures.

Nonarbitrary comparative (MORE/LESS) relations were targeted prior to arbitrary MORE/LESS relations, because the latter are thought to be more complex than the former (Hayes et al., 2001), which are based on the physical size dimensions of stimuli. During the TT procedure for nonarbitrary relations the Investigator presented laminated card stimuli (6cm x 9cm) with images of greater and smaller piles of objects. The pictorial stimuli were presented on the Table-Top in front of each participant in the following format: Sample stimulus on top, comparison below this and two printed response options 'MORE' and 'LESS' below the other stimuli. The comparative response always corresponded to the sample stimulus. For example, if the sample stimulus depicted a greater amount than the comparison, the correct response was to select 'MORE', and if the sample stimulus depicted a lesser amount than the comparison, the correct response was to select 'LESS'. The left/right position of response options remained constant throughout the Table-Top procedure. The Investigator prompted the child to select the correct response during the first few trials (3 or 4) in order to teach the child the correct relations; for example, if the sample stimulus presented a greater amount the Investigator said "Point to More", and gestured toward the card with the printed word MORE, and when the sample stimulus presented a lesser amount the Investigator said "Point to Less", and provided a gestural prompt. The verbal and gestural prompts were faded after initial trials. Positive reinforcement procedures throughout Study 2 were used similarly as described in Study 1. Corrective feedback was delivered for incorrect responding. The Investigator manually recorded speed and accuracy during the TT procedure using paper and pencil, prepared data sheets, and a stopwatch.

T-IRAP: MORE/LESS nonarbitrary relations. Trials in the T-IRAP teaching program for nonarbitrary MORE/LESS relational responding presented pictorial stimuli that were visual images of greater/lesser amounts of objects (similar to those used during TT teaching). The sample stimulus was presented onscreen above a comparison stimulus and the response options, printed words "MORE" and "LESS" were presented underneath the comparison stimulus. Right/left position of response options were counter-balanced across trials during T-IRAP trials and participants selected a response option by pressing either 'd' or 'k' on the keyboard as appropriate. As in the Table-top procedure, correct selection of the response option was related to the sample stimulus, so that if the sample stimulus presented depicted a greater amount of objects than the comparison stimulus presented, the correct response was to select 'MORE' by pressing the appropriate key (either 'd' or 'k'). Conversely if the sample stimulus presented a lesser amount of objects than the comparison stimulus the correct response was to select 'LESS' by pressing the correct key (either 'd' or 'k'). As in Study 1, the T-IRAP provided corrective feedback in the form of a red '×' for selecting an incorrect response option and trials did not proceed until the participant selected the correct response option.

Table-top: MORE/LESS arbitrary relations. When participants had completed the T-IRAP program for nonarbitrary MORE/LESS relational responding, they proceeded to learn arbitrary MORE/LESS relational responding. A multiple baseline design was again implemented across four children during arbitrary relational training procedures, to compare learning outcomes in TT and T-IRAP teaching conditions. The TT teaching commenced first with four participants, and during trials the Investigator presented laminated cards, 6cm by 9cm, with pictorial and printed stimuli (Figure 6). If a 1 Euro coin was presented as a sample stimulus with a 50 cent coin as comparison stimulus, the correct response was to select 'MORE' because the 1 Euro coin has greater value than the 50 cent coin, although the 50 cent coin is a physically larger coin. Conversely if a 50 cent coin was presented as sample stimulus with a 1 Euro coin presented as comparison, the correct response was to select 'LESS'. Students were thus learning to select the options 'MORE' or 'LESS' based on the value arbitrarily assigned to the stimuli by the social community, and not based on physical size.

During TT trials, stimuli were presented in a similar format to that in the nonarbitrary procedure with the sample stimulus on top, comparison below this, and two response options which were printed words "MORE" and "LESS" below the comparison stimulus. Left/right position of the response options were not counterbalanced across TT trials. Initially, the Investigator prompted the child to select the correct response option, and after three or four trials the prompts were faded so that participant responding became independent. Reinforcement contingencies for correct responding were delivered similarly as before. Throughout the TT teaching procedure the Investigator manually recorded speed and accuracy of relational responding using paper and pencil and a stopwatch. When data were collected across 5 trial-blocks for all four participants, a T-IRAP teaching program was introduced with one participant. The three other participants continued in

TT teaching conditions and the T-IRAP was introduced across these participants in a staggered fashion as before (e.g., after 10, 15, and 20 trial blocks) when sufficient data were collected to provide a graphic impression of relational learning (speed and accuracy) in TT conditions.

T-IRAP: MORE/LESS arbitrary relations. The T-IRAP interactive program for teaching arbitrary MORE/LESS relations operated similarly to the T-IRAP for nonarbitrary MORE/LESS relations, except that the pictorial stimuli presented were different and the physical size of the stimuli was not relevant. Reinforcement procedures were arranged for individual participants as described previously.

» RESULTS AND DISCUSSION

MORE/LESS nonarbitrary relations

The data for nonarbitrary comparative relational responding during TT and T-IRAP procedures with four participants are represented in Figure 7. Accuracy data are represented using an unbroken line between data points, and duration data are represented using a broken line between data points. Accuracy data points represent percentage correct scores for each trial-block (*y* axis). Duration data are depicted by using a second value axis (right of graph), and duration data points represent the time taken in seconds to complete each trial-block.

The accuracy data for Robert (Figure 7, top panel) during the TT procedure for MORE/LESS nonarbitrary relational responding initially showed a relatively low level (40% correct) and showed an ascending trend with some variability across 5 trial-blocks. The duration data also showed a slightly ascending trend across five trial-blocks for Robert during the TT teaching, which was not a positive trend and indicated that speed of responding actually decreased somewhat as teaching progressed. When the T-IRAP was introduced with Robert after 5 TT trial-blocks, the accuracy data ascended in a more stable slope than previously up to criterion levels after 11 T-IRAP trial-blocks. The T-IRAP trial-block duration data (based on recorded response latencies averaged across each trial-block) showed an immediate drop in level, and proceeded in a gradually descending trend across T-IRAP trial blocks, indicating increased speed of responding during T-IRAP teaching.

The accuracy data for Niamh (Figure 7, second panel) during TT teaching for nonarbitrary comparative relational responding were initially quite low (20% correct) and then showed an ascending trend, but with quite some variability. The duration data for Niamh during TT teaching showed no discernable trend, therefore speed of responding failed to increase across 10 trial-blocks. When the T-IRAP teaching procedure for nonarbitrary comparative relational responding was introduced for Niamh, the data showed a steady increase of accurate responding with very little variability and the trend proceeded to high stable levels of accurate responding. Niamh met the accuracy learning criterion after 16 T-IRAP trial-blocks.

The accuracy data for Conor (Figure 7, third panel) during comparative nonarbitrary relational responding in TT teaching conditions commenced at low levels (10% correct) and showed a fairly steady ascent across 15 trial-blocks. The data representing speed of responding (duration data) for Conor during TT teaching remained relatively flat indicating that speed of responding

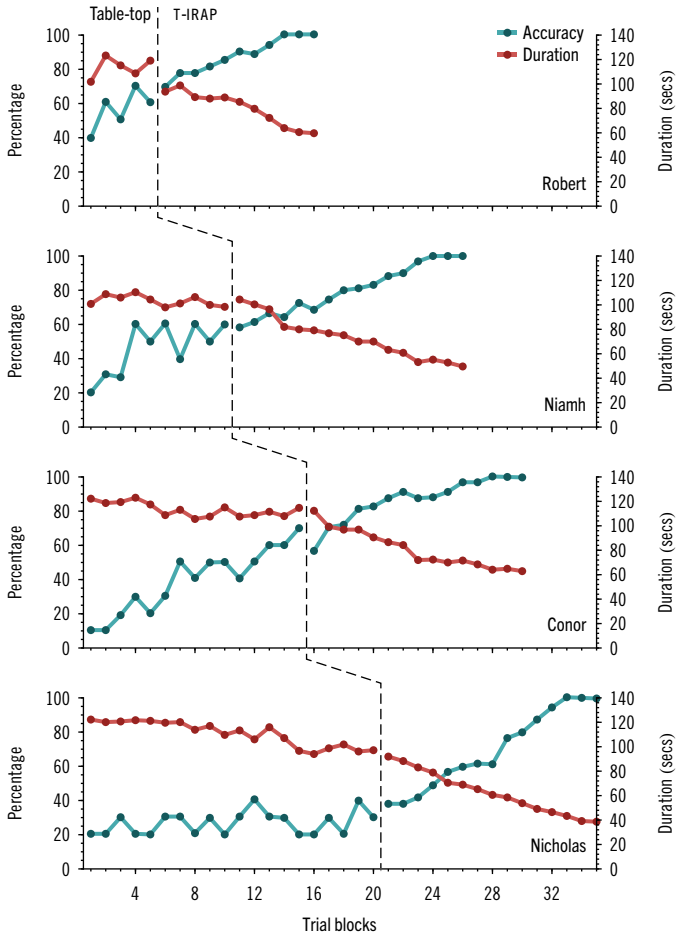


Figure 7. Nonarbitrary MORE/LESS relational data for four participants in TT and T-IRAP teaching conditions

failed to increase across 15 trial-blocks. From the point of T-IRAP introduction, Conor's accuracy data for MORE/LESS responding showed a steady ascent with little variability up to high stable levels of accurate responding, and met criterion after 15 T-IRAP trial-blocks. The duration data for T-IRAP teaching steadily decreased to lower levels indicating faster relational responding during T-IRAP teaching compared to TT teaching.

The accuracy data for MORE/LESS nonarbitrary relational responding during TT teaching for Nicholas (Figure 7, bottom panel) showed low somewhat variable levels (approximately 20–40% correct) with little or no trend evident throughout a total of 20 TT trial-blocks. Duration data for Nicholas during TT teaching were initially flat across trial-blocks and then showed a gradually descending trend, indicating some gains in speed of relational responding. After the extended amount of TT trial-blocks (20), the T-IRAP for teaching comparative nonarbitrary relational responding was introduced with Nicholas. The accuracy data during T-IRAP teaching showed a steady ascent to high stable (criterion) levels after 15 trial-blocks. The duration data for Nicholas during T-IRAP teaching showed a more steady and steeper descent across 15 T-IRAP trial-blocks compared to duration data across 20 trial-blocks in the TT teaching condition, thus indicating Nicholas' MORE/LESS relational responding was gaining speed during the T-IRAP program.

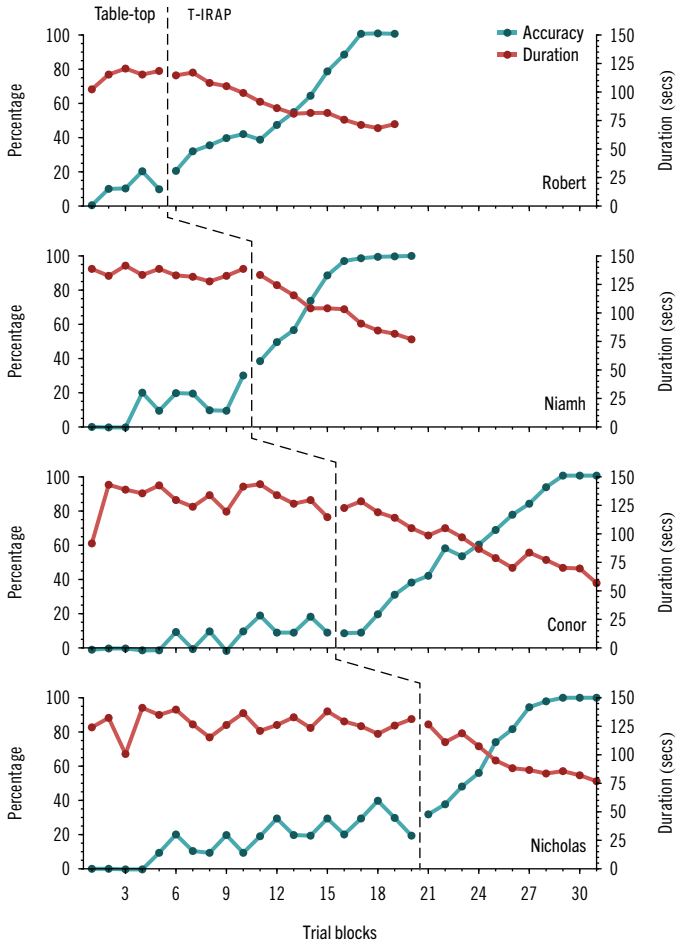


Figure 8. Arbitrary MORE/LESS relational data for four participants in TT and T-IRAP teaching conditions

Briefly, the data for four participants indicated that speed of MORE/LESS nonarbitrary relational responding increased more rapidly and steadily during T-IRAP teaching compared to Table-Top teaching. Interestingly, the accuracy levels of data for comparative relational responding for all participants were nevertheless maintained, and even showed a steeper slope (increased accuracy) during T-IRAP teaching compared to TT, indicating that accuracy of participants' relational responding was by no means compromised by the speedier responding evident in the T-IRAP procedure.

MORE/LESS arbitrary relations

The data for four participants learning arbitrary comparative relational responding using TT and T-IRAP procedures are represented in Figure 8. The accuracy data (unbroken line) for Robert (top panel) during TT trial-blocks showed low levels of accurate responding, with some variability. Robert's duration data for TT teaching ascended slightly, indicating that relational responding was becoming slower across 5 trial-blocks. During the T-IRAP procedure, the accuracy data for Robert showed a steadily trend that reached criterion levels. T-IRAP duration data for Robert showed a gradually descending trend indicating that relational responding had increased in speed.

The accuracy data for Niamh (Figure 8, second panel) during MORE/LESS arbitrary relational responding showed very low levels with some variability across a total of 10 trial-blocks of the TT procedure. Duration data remained flat at high levels, indicating that speed of responding failed to increase across TT teaching procedures. When the T-IRAP procedure was introduced with Niamh after 10 TT trial-blocks, there was a rapid increase in accurate responding that rose to criterion levels. Duration data for Niamh showed a steadily decreasing trend during T-IRAP for arbitrary comparative relations, indicating that speed of responding was increased across trial-blocks.

The accuracy data for Conor (Figure 8, third panel) during TT teaching remained at zero levels across the first five trial-blocks of arbitrary MORE/LESS relational responding, and remained at very low levels throughout some 15 trial-blocks. Duration data for Conor indicate that speed of responding failed to increase across TT procedures. When the T-IRAP procedure was introduced accurate responding initially remained low across trial-blocks 16 and 17, and then there was a steady increase in accuracy up to the criterion performance level. Duration data for Conor during T-IRAP teaching overall showed a steadily decreasing trend, indicating that speed of relational responding was increasing across trial-blocks.

Nicholas' data (Figure 8, bottom panel) for arbitrary MORE/LESS relational responding during TT teaching showed the first four trial-blocks with zero correct and although some correct responding was shown across the next TT trial-blocks, the data remained at low levels with some variable responding across 20 trial-blocks. Duration data for Nicholas were high and variable with no discernible trend during TT teaching, indicating there were no gains in speed of responding throughout these numerous trial-blocks. When the T-IRAP for arbitrary comparative relational responding was introduced with Nicholas subsequent to 20 TT trial-blocks, the accuracy data ascended steadily to criterion levels. Duration data for Nicholas during the MORE/LESS arbitrary relational trials showed a descending trend, indicating that speed of responding was increased across these eleven T-IRAP trial blocks.

In summary, results in Study 2 showed that the T-IRAP could be used to teach comparative relational responding with four children diagnosed with autism. Findings showed that participants responded with greater accuracy and speed during T-IRAP teaching compared to TT teaching, and this effect was more pronounced during the more complex arbitrary comparative relational responding compared to relational responding with nonarbitrary stimuli (based on physical size).

The results in Study 2 supported and extended the findings in Study 1 that the T-IRAP was a useful teaching tool for establishing rapid and accurate relational responding with four children with diagnosed autism.

Study 3: Oppositional relational skills

The aim in Study 3 was to adapt the T-IRAP to teach Oppositional relational responding and to test for derived relational responding, which would further expand the complexity of relational responding skills for four children with diagnosed autism who had previously learned coordination relational responding

(SAME/DIFFERENT; Study 1), and comparative relational responding (MORE/LESS; Study 2). As in the previous studies in the current series, the T-IRAP and TT teaching procedures were compared regarding speed and accuracy in relational learning outcomes for the four participants; however, in Study 3 the comparison was made regarding nonarbitrary relations only. Oppositional relations may be more complex than, for example, SAME/DIFFERENT relations (Hayes et al., 2001), however, it is not currently clear that OPPOSITIONAL relations are typically learned by children subsequent to comparative relations; OPPOSITIONAL relations may be more complex and difficult to learn than comparative relations, or may be similarly difficult as comparative relations, but further research is needed to clarify these matters.

An adapted multiple-baseline design across participants was employed, and all participants were exposed firstly and simultaneously to TT teaching for nonarbitrary OPPOSITIONAL relational responding with the T-IRAP introduced at staggered time intervals (after 5 trial-blocks, 10 trial-blocks, 15 trial-blocks, and 20 trial-blocks) across the four participants. As in previous studies, teaching commenced with nonarbitrary relational responding because it seems likely that relations based on physical dimensions of stimuli are more readily learned than relations between stimuli that are assigned by the context and arbitrary in the sense that they are not physically-based. It may be that nonarbitrary Oppositional relations are foundational to learning arbitrary Oppositional relations skills, although this is not currently clear. Nonarbitrary SAME/OPPOSITE relations in the current teaching context involved, for example, night as opposite to day (Figure 9); full container as opposite to empty container; and so on. Arbitrary Oppositional relations were taught subsequent to nonarbitrary Oppositional relations, with the T-IRAP only. Due to time constraints, the teaching for arbitrary OPPOSITIONAL relations did not involve any TT teaching or any comparison between TT and T-IRAP teaching procedures. Subsequent to the T-IRAP for arbitrary Oppositional relations, four participants were exposed to two tests for derived opposition relations using the T-IRAP.

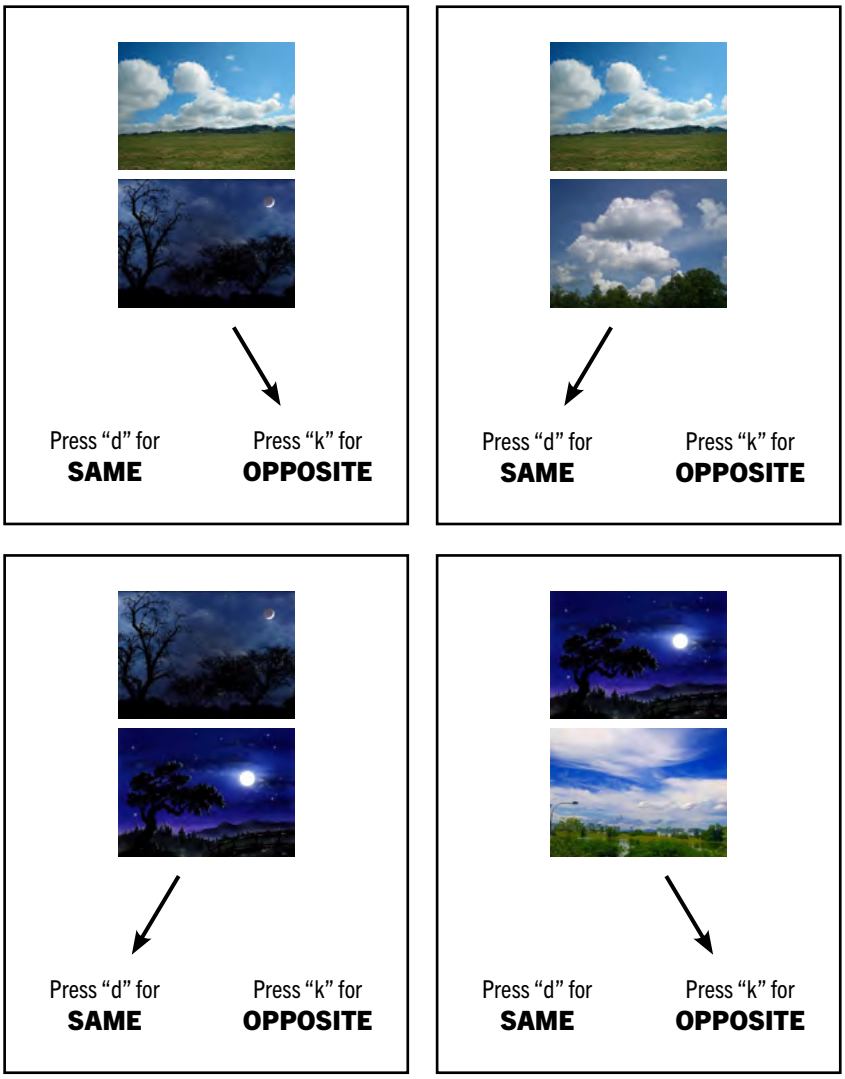


Figure 9. Trial presentation format for oppositional relational responding with nonarbitrary stimuli

The test for derived relational responding was an additional aspect of Study 3 that extended the prior two studies in relational responding with four participants with autism. As outlined in the general introductory section, derived relational responding (DRR) is an advanced type of relational responding that emerges untaught for typically-developing and language-able humans when a number of relations have been learned. For example, if humans learn that A is opposite to B, and B is opposite to C, they will typically derive A is same as C without being explicitly taught. This type of advanced arbitrary relational responding is thought to be fundamental to development of complex cognitive repertoires and it may be important therefore to establish DRR skills in children with autism. Thus, in Study 3, arbitrary SAME/OPPOSITION relational responding was taught as follows based on a published protocol (Rehfeldt & Barnes-Holmes, 2009): X is small and is the opposite of Z, and Z is the same as P. Is Z big or small, and is P big or small? The T-IRAP was adapted to answer this question using four phases (see Figure 10). Phase A taught the relations X/SMALL/SAME; X/BIG/OPPOSITE. Phase B taught Z/P/SAME; Z/X/OPPOSITE. Phase C probed for derived relational responding Z/BIG/SAME? Phase D probed for derived opposition relations P/SMALL/SAME?

» METHOD

Participants

Participants were the same as in Studies 1 and 2. The setting was the children's school classroom, also as per Studies 1 and 2, and there were no additional ethical issues relevant to Study 3.

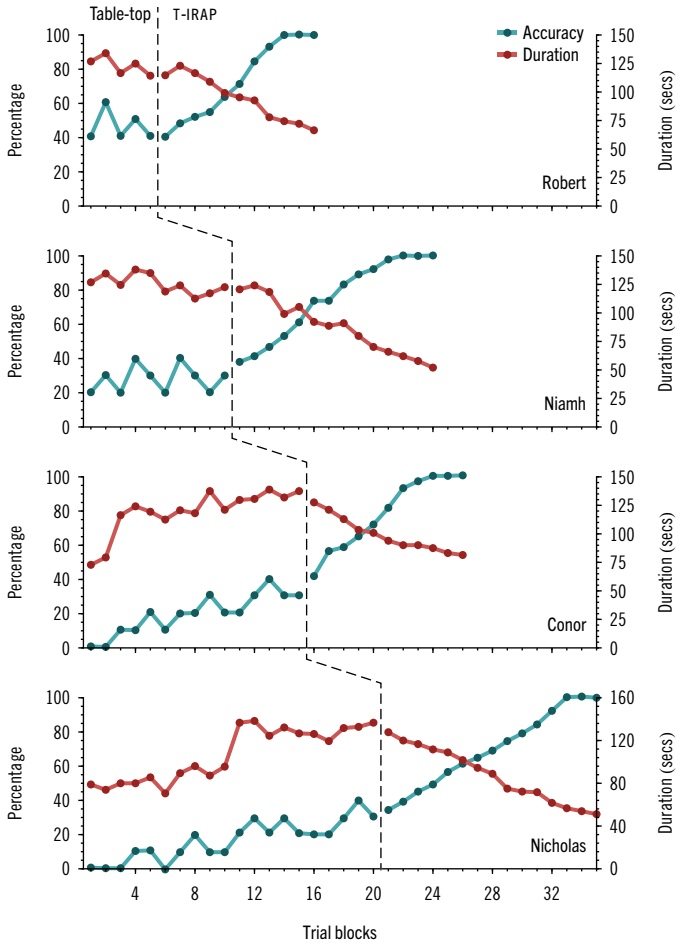


Figure 10. Nonarbitrary oppositional relational data for four participants in TT and T-IRAP teaching conditions

Apparatus and materials

T-IRAP. See also general details provided in Study 1 regarding T-IRAP procedure. The T-IRAP program was readily adapted to present trials with pictorial stimuli with SAME/OPPOSITE physical dimensions (e.g., Day and Night scenes; empty and full containers; Figure 9) when teaching nonarbitrary oppositional relations. Arbitrary stimuli (printed letters and words) were used subsequently in teaching arbitrary oppositional relations and during the test for derived oppositional relations. These stimuli were presented with the onscreen response options which were the printed words SAME and OPPOSITE.

Table-top. Laminated card were used with pictorial stimuli (6 cm × 9 cm) similar to that presented during T-IRAP trials for nonarbitrary OPPOSITIONAL relations, and with the printed words SAME and OPPOSITE. (Arbitrary opposition relations were not taught using TT procedures.)

Procedure

Table-top: OPPOSITIONAL nonarbitrary relations. An adaptation of the multiple baseline design across four participants was used to compare a TT teaching procedure with a T-IRAP teaching procedure to determine if the introduction of the T-IRAP program impacted relational learning in terms of changes in accuracy (percentage correct) and or speed of responding (measuring trial-block duration). Trials during TT teaching involved the Investigator presenting nonarbitrary pictorial stimuli positioned as follows: Sample stimulus positioned above comparison stimulus, and two response options (printed words SAME and OPPOSITE) below both of the pictorial stimuli (Figure 9). Response options were not counterbalanced during the TT procedure as it was felt that this might unduly impede speedy presentation as the Investigator would have to manually manipulate and keep track of the stimuli during each trial. During the first 3 or 4 trials the Investigator instructed or prompted (gestured) the child to select the correct response (e.g., select OPPOSITE if the pictorial stimuli presented were scenes of Day and Night, select SAME if both stimuli presented were non-identical Day scenes). In the former case, the verbal prompt was "Point to opposite", and in the latter case the Investigator said "Point to same". Prompts were rapidly faded and participants responded independently.

Positive reinforcement procedures were conducted similar as in previous studies in the current series, and corrective feedback was delivered contingent on incorrect responding. During TT teaching, the Investigator manually recorded speed and accuracy using paper and pencil, prepared data sheets, and a stopwatch.

The TT procedure for nonarbitrary OPPOSITIONAL relations was commenced simultaneously with all four participants. Subsequent to all four participants having completed 5 trial-blocks (10 trials in each block) of TT teaching, a T-IRAP teaching procedure for teaching nonarbitrary OPPOSITIONAL relations was introduced with one participant. The three other participants continued across extended TT teaching conditions, and the T-IRAP was introduced with the remaining participants at staggered time intervals after 10, 15, and 20 trial-blocks.

T-IRAP: OPPOSITIONAL nonarbitrary relations. The T-IRAP program for nonarbitrary SAME/OPPOSITE relational responding presented pictorial stimuli with images with similar or opposite dimensions (e.g., two different scenes of Night, or one scene of Day and one of Night, respectively). The onscreen stimulus presentation format was similar to that used in TT teaching: Sample stimulus presented above a comparison stimulus and the response options, printed words SAME and DIFFERENT presented underneath the comparison stimulus. Participants selected a response option by pressing either 'd' or 'k' on the keyboard as appropriate, and the T-IRAP option was selected to counterbalance automatically the right/left position of response options across trials. The T-IRAP trials for OPPOSITIONAL relations again provided corrective feedback for incorrect responses in the form of a red '×' and failed to proceed until the participant made the correct response. The next trial presentation proceeded immediately when the participant made a correct response. When participants had successfully completed the T-IRAP program to teach nonarbitrary OPPOSITIONAL relations, they were then exposed to a T-IRAP program to teach arbitrary OPPOSITIONAL relations, followed by two brief tests probing for derived oppositional relations.

T-IRAP: OPPOSITIONAL arbitrary relations and derived relational responding. The procedure was based on a protocol outlined in the recently published text-book for DRR applications for learners with autism and other developmental disabilities

(Rehfeldt & Barnes-Holmes, 2009). Teaching and testing OPPOSITIONAL relational responding with arbitrary stimuli was conducted as follows in brief outline: Participants were taught that X is small and is the opposite of Z, and Z is the same as P. The tests that followed probed, is Z big or small, and is P big or small? The T-IRAP was adapted accordingly to present four Phases as follows (Figure 10).

Phase A (taught relations). Phase A: Trials presented, for example, the letter X as a sample stimulus above a printed word, either 'small' or 'big', with response options SAME and OPPOSITE below. The program provided reinforcement (trials proceed) and corrective feedback (red × and trials cannot proceed until the participant selects the designated correct response) for selecting SAME when trials presented X and 'small', and for selecting OPPOSITE when trials presented X and 'big'. The Investigator provided additional positive reinforcement contingent on participants' correct responding (e.g., token economy on a schedule tailored to the learning needs of the individual participant). Trial presentations and counterbalancing of response options across phases A and B were operated similarly as for T-IRAP for nonarbitrary SAME/OPPOSITE relations, and when relational responding met a preset accuracy criterion (100% × 3 trial-blocks) during the T-IRAP training trials, the next phase was commenced with that participant.

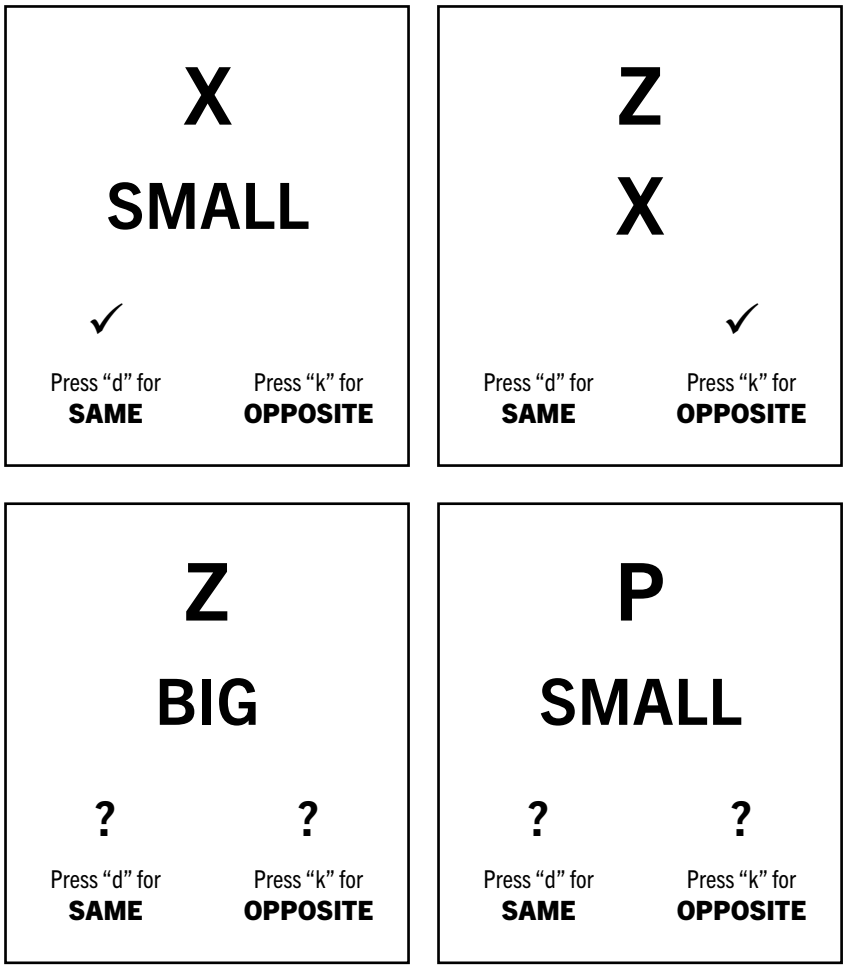


Figure 11. Trial presentation format for SAME/DIFFERENT relational responding with arbitrary stimuli.

Phase B (taught relations). Procedures were operated similarly as in Phase A, except that on this occasion trials presented Z above either X or P with the response options SAME/OPPOSITE below; reinforcement was delivered for selecting SAME when trials presented Z and P, and for selecting OPPOSITE when trials presented Z and X.

Phase C (test 1). Test trials presented Z and either the word 'big' or 'small' above response options SAME/OPPOSITE. No programmed contingencies were arranged and test trials proceeded unimpeded regardless whether participant responding was correct or incorrect. Children were told at the beginning of the test: "This is a test so I'm not going to say if you picked the right word, but you will get tokens when it is finished for working nicely. Do your best to pick the right word nice and quickly". If participants selected the SAME response option during trials presenting Z and 'big', and selected the DIFFERENT response option when trials presented Z with 'small', trials were recorded as correct. Trial-blocks during testing had 10 trials, and the criterion for demonstrating derived relational responding was preset at 100% × 3 trial-blocks.

Phase D (test 2). Test procedures were similar to Phase C except that on this occasion trials presented P above either 'big' or 'small' with the response options SAME/OPPOSITE. If participants selected the SAME response option during trials presenting P and 'big', and selected the DIFFERENT response option when trials presented P with 'small', trials were deemed correct.

» RESULTS

Oppositional relations (nonarbitrary)

The data for four participants with diagnosed autism who were taught OPPOSITIONAL relational responding in TT and T-IRAP procedures are represented in Figure 11. Accuracy data are represented using an unbroken line between data points, and duration data are represented using a broken line between data points. Accuracy data points represent percentage correct scores for each trial-block (*y* axis). Duration data are depicted by using a second value axis (right of graph), and duration data points represent the time taken in seconds to complete each trial-block.

The accuracy data for Robert (Figure 11, top panel) throughout TT teaching showed some variability and no trend was evident, while the duration data were also a little variable but appeared overall to be descending across 5 trial-blocks. When the T-IRAP teaching program for nonarbitrary Oppositional relations was introduced at this point Robert's accuracy data for relational responding showed a very steady upward trend to criterion levels (100% across 3 trial-blocks). Duration data during T-IRAP teaching showed a descending trend indicating that responding was speedier than in TT teaching, even though accuracy increased and was maintained at high levels.

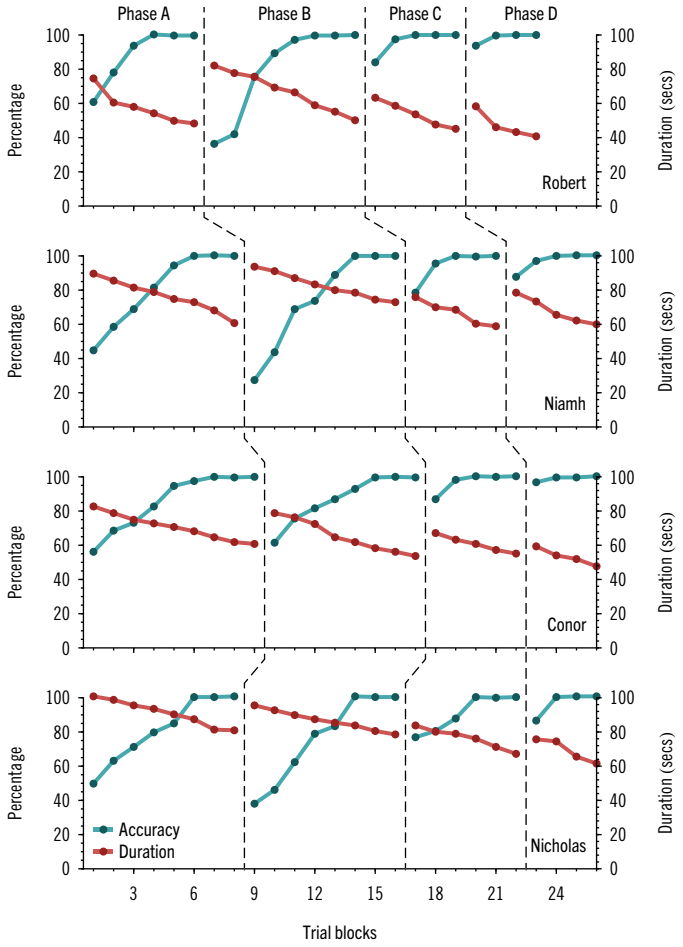


Figure 12. Arbitrary oppositional relational data for four participants (phases A and B). Test data for derived opposition relations (phases C and D)

The data for Niamh (Figure 11, second panel) for nonarbitrary OPPOSITIONAL relations were extended across 10 trial-blocks in the TT teaching condition, and indicated low and variable levels of accurate responding. Duration data for Niamh remained at high slightly variable levels with no trend overall, indicating that speed of responding did not increase across 10 trial-blocks of TT teaching. Accuracy levels for oppositional relational responding steadily increased when the T-IRAP teaching program was introduced for Niamh after 10 TT trial-blocks, and the accuracy criterion was achieved across 14 T-IRAP trial-blocks. Duration data showed a decreasing trend across T-IRAP teaching, indicating that speed or responding increased.

Conor's data (Figure 11, third panel) for nonarbitrary OPPOSITIONAL relational responding remained at zero levels during 2 initial TT trial-blocks and remained somewhat low and variable levels across a total of 15 TT trial-blocks. Duration data during TT showed a surprising ascending trend, indicating that speed was decreasing across these extended TT trial-blocks. When the T-IRAP teaching program for nonarbitrary oppositional relations was commenced with Conor, accuracy levels of relational responding steadily ascended to the criterion levels after a total of 11 T-IRAP trial-blocks. Interestingly, the duration data showed a descending trend throughout the T-IRAP teaching procedure indicating that speed of relational responding increased during this phase even while accuracy also increased.

The accuracy data for nonarbitrary OPPOSITIONAL relational responding for the fourth participant, Nicholas (Figure 11, bottom panel) during TT teaching showed zero correct across 3 initial trial-blocks, and data remained at low levels throughout a total of 20 TT trial-blocks, while the duration data showed an ascending trend, indicating speed of relational responding was actually decreasing across 20 trial-blocks. The T-IRAP procedure for nonarbitrary relational responding was introduced for Nicholas at this point, and accuracy data immediately stabilised and gradually but steadily ascended to the criterion levels across 15 T-IRAP trial-blocks. Duration data in the T-IRAP teaching condition showed a steadily descending trend indicating that speed of relational responding increased.

T-IRAP: oppositional relations (arbitrary)

Phase A. The data for four participants are presented in Figure 12. Accuracy levels for arbitrary oppositional relational responding for Robert (top panel) ascended steadily to the criterion levels across 6 trial-blocks, while duration data descended simultaneously, indicating that speed of responding increased. Accuracy data for Niamh (second panel) showed a fairly steady ascent to criterion levels across 8 trial-blocks and Niamh's duration data showed a descending trend indicating that speed of responding increased. The data for Conor (third panel) during Phase A showed a steady ascending trend to the criterion performance level, while simultaneously the duration data showed a descending trend indicating increased speed across 9 trial-blocks. The data for Nicholas (bottom panel) in this phase showed that accuracy steadily increased and the criterion performance was achieved across 8 trial-blocks. Duration data for Nicholas showed a slowly decreasing trend toward speedier responding.

Phase B. Robert's accuracy data (Figure 12, top panel) began at a relatively low level but showed a steep slope toward the criterion levels across 8 trial-blocks. Speed of responding increased across these trial-blocks as indicated by a descending trend in the duration data. Niamh's accuracy data (second panel) during Phase B showed a rapidly ascending trend to criterion levels across 8 trial-blocks, and duration data showed a descending trend. A similar pattern showed in Conor's data (third panel) during this phase, in that accuracy increased across 8 trial-blocks while a descending trend in duration data indicated increased speed in relational responding. Nicholas' accuracy data (bottom panel) showed a steady ascending trend to criterion, and the duration data showed a gradual descent as speed of responding increased.

Phases C and D (tests for derived oppositional relations). The test data for four participants during Phases C and D are presented in Figure 12. All four participants commenced with high levels of accurate responding and achieved a criterion performance during phases C and D. Four participants were thus deemed to have demonstrated derived opposition relations across both tests.

» GENERAL DISCUSSION

A series of three studies showed that it was possible to adapt the existing freely available IRAP so that it could be used as an interactive computerised teaching tool, renamed T-IRAP, to teach fluent relational responding skills with four children diagnosed with au-

tism. The relational frames targeted were SAME/DIFFERENT (Study 1), MORE/LESS (Study 2), SAME/OPPOSITE and derived relational responding (Study 3). All relational frames were taught with nonarbitrary stimuli before targeting the same relational frames with more abstract arbitrary stimuli to build complexity in relational responding repertoires, and all four participants succeeded in learning all targeted relational frames with nonarbitrary and arbitrary stimuli. Levels of accuracy and speed of responding (interpreted via trial-block duration data) for all participants were compared in TT and T-IRAP teaching conditions, and results showed that levels of accuracy and speed of responding were increased for all participants during all T-IRAP teaching in comparison to TT teaching. These effects were found with four participants across all three studies for both nonarbitrary and arbitrary SAME/DIFFERENT, MORE/LESS and OPPOSITIONAL relations. The T-IRAP was also used to probe for derived relational responding (Study 3) and four participants demonstrated derived opposition relations. Specifically, during tests with no programmed reinforcement the four participants demonstrated opposition relations that emerged without having been taught or directly reinforced; they derived SAME/OPPOSITE functions for the test stimuli in accord with previously taught opposition relations (Hayes et al., 2001).

As stated in the general introductory section, to suggest that the T-IRAP should replace TT teaching for relational responding would not be desirable or ecologically valid, however, the current findings suggest that the T-IRAP may be a useful additional teaching tool that a child could use for practice without the necessity of one-on-one teaching. Initially there were minor difficulties for three out of four participants with autism using the T-IRAP (Study 1), but relatively minimal training was sufficient to teach the prerequisite correspondence between response options onscreen and the relevant keys on the keyboard, and participants could then successfully engage with the T-IRAP program. A fourth participant with autism readily engaged with the T-IRAP and needed no pretraining. Future research may be necessary to determine if other children with lower levels of adaptive functioning need more extensive pretraining to learn to use the T-IRAP program. For some children, it may be more efficient to teach correspondence between the response options and the relevant keys on the keyboard via a material prompt stretching from the onscreen response options to the relevant keys on the keyboard (pilot data indicated that this may be effective). In any event, time spent in pretraining need not be seen as a great disadvantage, because currently the use of computer technology is so widespread in education that the acquisition of computer literacy skills may be seen as useful. In addition, developing proficiency in learning via computer can facilitate more independence for students in need of practice either for learning or maintaining relational responding skills. Study 1 thus successfully adapted the T-IRAP to target nonarbitrary and arbitrary coordination relations (SAME/DIFFERENT) with four children with autism, and a comparison of learning outcomes with TT and T-IRAP teaching showed that participants' relational responding was more accurate and rapid with T-IRAP. The effects were demonstrated by the use of staggered introduction of the T-IRAP across participants after extended time intervals and numerous TT trial-blocks (an adaptation of a multiple baseline design across participants). Visual analyses of the resulting graphs show that accuracy increased and duration data decreased indicating greater speed of responding on each occasion that the T-IRAP was introduced, and this was replicated across participants.

Study 2 extended the research conducted in Study 1, and adapted the T-IRAP to successfully establish nonarbitrary and arbitrary comparative relational skills (MORE/LESS), which are thought to be more complex than coordination relations (Hayes et al., 2001), with four participants with autism. In addition, Study 2 counter-balanced the left/right position of the response options during T-IRAP trials to facilitate teaching more fluent relational responding, whereas left/right position of response options was held constant during all procedures in Study 1 to help students learn basic relational responding skills. Counter-balancing of left/right position was not conducted during TT procedures in any of the studies in the current series because it was felt that this would be quite an impediment to speedy responding due to time spent by the Instructor in manually arranging the stimuli during each trial, as well as keeping track and manually recording correct and incorrect responding. It seems likely therefore that had the TT procedures in studies 2 and 3 incorporated counterbalancing of left/right position of response options, the difference in speed of responding between TT and T-IRAP may have been even greater than that observed. A further point of interest regarding the comparison data for teaching procedures in Study 2 was that in general there appeared to be greater differential effects between resulting learning outcomes from the two programs compared to that found in Study 1. Specifically, visual analyses of graphs suggested that the positive differential effects on speed and accuracy for T-IRAP versus TT appeared more pronounced for all participants in Study 2. The reason for this remains unclear at this point in time, but it might be speculated that the children were becoming more generally proficient at using the T-IRAP as they continued to engage with the program, whereas proficiency levels of responding in TT teaching had perhaps already reached optimal levels prior to the current research due to participants' extensive experience with the latter teaching format at school. Findings in Study 2 were consistent with those in Study 1, in that across teaching procedures for both nonarbitrary and arbitrary relational responding across participants, the data at no point showed deterioration in either speed or accuracy in relational responding when T-IRAP was introduced. Furthermore, increased accuracy in relational responding was maintained across T-IRAP trial-blocks even as the speed of responding was increased for all four participants. In contrast, speed of responding failed to increase during TT teaching even while accuracy levels remained low across extensive numbers of trial-blocks with three participants.

Results in Study 3 replicated findings in studies 1 and 2 in that the T-IRAP was readily adapted to teach oppositional relations with four participants diagnosed with autism, and a comparison of relational learning data for four participants in TT versus T-IRAP teaching conditions showed that speed and accuracy of relational responding were increased during T-IRAP teaching for nonarbitrary oppositional relational responding. Study 3 extended the previous studies in targeting the relational frames of opposition (nonarbitrary and arbitrary) with four participants with autism, and an

additional extension was that subsequent to a T-IRAP teaching procedure for teaching arbitrary opposition relations, participants demonstrated derived opposition relations using the T-IRAP. Due to time constraints, TT and the T-IRAP were compared only when teaching nonarbitrary opposition relations (no comparison was made when teaching arbitrary oppositional relations). Graphs for all four participants showed quite some disparity between levels of speed and accuracy of relational responding recorded during TT and T-IRAP teaching. Specifically, the T-IRAP data for nonarbitrary opposition relations showed markedly greater speed and accuracy levels for four participants when compared to the TT data.

Four participants with autism learned arbitrary opposition relations via the T-IRAP, and speed and accuracy data were roughly comparable with participant data during the T-IRAP for nonarbitrary opposition relations. Importantly, Study 3 showed that four participants demonstrated derived opposition relations with arbitrary stimuli when tested via a T-IRAP procedure. As stated in the general introductory section, derived relational responding is thought to underlie generativity of the kind typically shown in human language; research has shown that even a small number of taught relations among stimuli may promote learning an exponential number of derived relations (Wulfert & Hayes, 1988). This type of emergent generative responding appears to be similar to the processes that underlie generative speech and novel utterances, and thus may be very useful for children with autism who frequently do not show generative language and indeed may fail to show generative learning of any kind from an initial context to a novel context (Lovecky, 2004). The success in teaching complex arbitrary relations in the current research is quite significant as arbitrary relational responding has been shown to be important regarding intelligent behavior (Cassidy et al., 2011; O'Hora et al., 2008). The research conducted by Cassidy et al. with educationally disadvantaged children showed that learning complex arbitrary relational responding resulted in positive impacts in children's IQ scores. These findings accord with theoretical predictions and preliminary investigations in derived relational responding and intelligent responding (see Relational Frame Theory; Hayes et al., 2001; O'Toole & Barnes-Holmes, 2009; O'Hora et al., 2005; O'Hora et al., 2008).

The current series of studies highlight how the principles of derived relational responding can be incorporated into a contemporary applied behavioral approach to teaching and combined with positive reinforcement and other well-known principles to teach flexible relational responding (O'Toole, Barnes-Holmes, Murphy & O'Connor 2009). Four children with diagnosed autism successfully learned various and complex relational responding skills (coordination, comparison, opposition, with nonarbitrary and arbitrary stimuli; derived opposition relations) across three experimental studies, and resulting data demonstrated that the T-IRAP produced more favourable learning outcomes compared to TT teaching for all participants across all procedures compared in three studies. Specifically, relational responding skills for all four participants were shown to be more fluent during T-IRAP, insofar as there was greater speed and accuracy shown during T-IRAP teaching. This was the case even when complexity was advanced to arbitrary relational responding with four participants.

The experimental design used in the current research used staggered introduction of T-IRAP with four participants who had been exposed to extended TT trial-blocks (up to 20). The design allowed a demonstration of positive effects on speed and accuracy data for relational responding subsequent to the introduction of the T-IRAP, and effects were replicated across four participants for all relations targeted (nonarbitrary and arbitrary) across three studies. These findings provide support for the T-IRAP as an efficient teaching tool, however, because the T-IRAP was always introduced subsequent to the Table-Top teaching procedure, results may be viewed as vulnerable to sequence effects. Notwithstanding this, in many cases the TT procedures were extended across numerous trial-blocks with participants prior to introducing T-IRAP, and the positive impact on trends and levels of speed and accuracy was frequently immediate or very soon after the T-IRAP was introduced. The replications across participants and across the three studies also make it less likely that the data were spurious; however future similar research using, for example, an alternating treatments design to compare relational learning in TT and T-IRAP may provide additional support.

It seems likely that the possibility of speedy responding is facilitated by T-IRAP program due to the fact that procedures are rapid and automatic. That is, all trial presentations are automatically presented intact on-screen during T-IRAP programs, whereas with TT procedures the teacher must manipulate the stimuli manually in order to present the trial, and the physical act of doing so may place a ceiling on the possibility of speedier responding for the child. Another advantage is that the speed and accuracy data are recorded automatically on the T-IRAP, because this also facilitates greater speed. Automated trial presentation and data recording may mean greater consistency in trial presentation and more accurate data than might be possible with manual procedures. Other features are that the time required to omit a response can be pre-determined (shortened or lengthened) in the set-up of the T-IRAP program as required, so that if child does not respond within the pre-determined time the trial is counted as incorrect. The time allowed to respond can be gradually shortened as the child's responding becomes faster until it reaches an acceptable fluency level. Programmed contingencies (red X contingent on incorrect response, proceed to next trial contingent on correct response) which provide immediate and consistent feedback are also advantageous, and can be supplemented with teacher delivered reinforcement. The speed and accuracy data presented onscreen may be useful feedback for learners setting goals and learning to self-monitor. Teaching programs in ABA frequently involve goal-setting for levels of accuracy and rate of responding, especially for example in Precision Teaching, such that learners aim for a higher target than their current level of competence and strive to beat their own record. This can provide a means of learning to compete with self, which avoids some of the potential problems related to competing with others, for example when there are substantial disparities in students' learning, competition with others may not be an optimal strategy for the slow learner. Students could be taught to graph their T-IRAP results and learn to self-manage goals and achievements, which may be important in and of itself as well as facilitating greater academic learning

(Wilkinson, 2008). From the perspective of the instructor, the T-IRAP is quite a simple program and can be readily adapted using an extensive variety of picture/word/numerical stimuli to teach numerous complex relations and categories. Other researchers are also refining computerised teaching methods for assessing and teaching relational responding (e.g., Moran, Stewart, McElwee & Ming, 2010; Cassidy et al., 2011), however it is hoped that the current research may provide an additional method that is flexible in terms of meeting teaching needs and is freely available to practitioners via the internet. ■

REFERENCES

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision; DSM-IV*. Washington DC: Author.

Barnes-Holmes, D., Barnes-Holmes, Y., Power, P., Hayden, E., Milne, R., & Stewart, I. (2006). Do you really know what you believe? Developing the Implicit Relational Assessment Procedure (T-IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist, 32*, 169–177.

Barnes-Holmes, Y. Barnes-Holmes, D. & Smeets, P. M. (2004). Establishing relational responding in accordance with opposite as generalized operant behavior in young children. *International Journal of Psychology & Psychological Therapy, 4 (3),* 559–586

Barnes-Holmes, Y., Barnes-Holmes, D., Smeets, P., Strand, P., & Friman, P. (2004). Establishing relational responding in accordance with more-than and less-than as generalized operant behavior in young children. *International Journal of Psychology and Psychological Therapy, 4*, 531–558.

Binder, C. (1996). Behavioral Fluency: Evolution of a New Paradigm. *The Behavior Analyst, 19,*163–197.

Cassidy, S., Roche, B. & Hayes, S. C. (2011). A relational frame intervention to raise intelligence quotients: A pilot study. *The Psychological Record, 61,* 1–26.

Cassidy, S., Roche, B., & O'Hora , D. (2010). Relational Frame Theory and human intelligence. *European Journal of Behavior Analysis, 11*, 37–51.

Cohen, H., Amerine-Dickens, M., & Smith, T., (2006). Early intensive behavioral treatment: replication of the UCLA Model in a community setting. *Developmental and Behavioral Pediatrics*, *27,* S145-S155.

DeLuca, R. V., and Holborn, S. W. (1992). Effects of a variable-ratio reinforcement schedule with changing criteria on exercise in obese and nonobese boys. *Journal of Applied Behavior Analysis, 25*, 671–679.

DeVries, J. E., Burnette, M. M., and Redman, W. K. (1991). AIDs Prevention: Improving nurses' compliance with glove wearing through performance feedback. *Journal of Applied Behavior Analysis, 24,* 705–711.

Gallagher, S. M., and Keenan, M. (2000). Independent use of activity materials by the elderly in a residential setting. *Journal of Applied Behavior Analysis, 33,* 325–328.

Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational Frame Theory. A post-Skinnerian account of human language and cognition*. New York: Kluwer Academic/Plenum.

Howard, J. S., Sparkman, C. R., Cohen, H. G., Green, G. & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities, 26,* 359–383.

Koegel, L. K., Koegel, R. L., and Carter, C. M. (1998). Pivotal responses and the natural language teaching paradigm. *Seminars in Speech and Language, 19,* 355–372.

Lovaas, O. I., (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55,* 3–9.

Lovecky, D. V. (2004). *Different minds: Gifted children with AD/HD, Aspergers syndrome, and other learning deficits*. London: Jessica Kingsley Publishers.

Maine Administrators of Services for Children with Disabilities (MADSEC; 2000). Report of the MADSEC Autism Task Force. doi: http://www.madsec.org/LinkClick.aspx?fileticket=YmikqkW4tFk%3D&tabid=81

Matson, J. L., and Coe, D. A. (1992). Applied Behavior Analysis: Its impact on the treatment of mentally retarded emotionally disturbed people. *Research in Developmental Disabilities, 13,* 171–189.

Moffitt, T. E., Caspi, A., Harkness, A. R. & Silva, P. A. (1993). The natural history of change in intellectual performance: Who changes? How much? Is it meaningful? *Journal of Child Psychology and Psychiatry, 34 (4),* 455–506.

Moran, L., Stewart, I., McElwee, J. & Ming, S. (2010). The Training and Assessment of Relational Precursors and Abilities (TARPA): a preliminary analysis. *Journal of Autism and Developmental Disorders, 40*, 1149–1153.

Murphy, C., & Barnes-Holmes, D. (2009). Derived more/less relational mands in children diagnosed with autism. *Journal of Applied Behavior Analysis, 42,* 253–268.

Murphy, C., Barnes-Holmes, D. and Barnes-Holmes, Y. (2005). Derived manding in children with autism: Synthesising Skinner's Verbal Behavior with Relational Frame Theory. *Journal of Applied Behavior Analysis, 38,* 445–462.

Myers, S. M. & Johnson, C. P. (2007). Management of children with autism spectrum disorders, The *American Academy of Pediatrics Council on Children With Disabilities, 120*, 1162–1182.

National Research Council (2001). *Educating Children with Autism,* Committee on Educational

Interventions for Children with Autism, Division of Behavioral and Social Sciences and Education, Washington, D. C.: National Academy Press. doi:http://books.nap.edu/books/0309072697/html/index.html

O'Hora, D., Peláez, M, Barnes-Holmes, D. & Amnesty, L. (2005). Derived relational responding and performance on verbal subtests of the WAIS-III. *The Psychological Record, 55*, 155–175.

O'Hora, D., Pelaez, M., Barnes-Holmes, D., Rae, G., Robinson, K., & Chaudhary, T. (2008). Temporal relations and intelligence: Correlating relational performance with performance on the WAIS-III. *The Psychological Record, 58*, 569–584.

O'Toole, C., Murphy, C., Barnes-Holmes, D. & O'Connor, J. (2009). Teaching flexible, intelligent and creative behavior. In R. A. Rehfeldt, & Y. Barnes-Holmes, *Derived Relational Responding: Applications for Learners with Autism and other Developmental Disabilities*. New Harbinger.

O'Toole, C., & Barnes-Holmes, D. (2009). Three chronometric indices of relational responding as predictors of performance on a brief intelligence test: The importance of relational flexibility. *The Psychological Record, 59*, 119–132.

Pierce, C. H., Hanford, P. V., & Zimmerman, J. (1972). Effects of different delay of reinforcement procedures on variable-interval responding. *Journal of the Experimental Analysis of Behavior*, *18 (1),* 141–146.

Rehfeldt, R. A. & Barnes-Holmes, Y. (Eds.) (2009). *Derived relational responding: Applications for children with autism and other developmental disorders*. CA: New Harbinger.

Rosales, R., & Rehfeldt, R. A. (2007). Contriving transitive conditioned establishing operations to establish derived manding skills in adults with severe developmental disabilities. *Journal of Applied Behavior Analysis*, *40*, 105–121.

Sallows, G. O. & Graupner, T. D. (2005). Intensive behavioral treatment for children with autism: Four year outcome and predictors. *American Journal of Mental Retardation, 110*, 417–438.

Sauter, R. A., & LeBlanc, L. A. (2006). Empirical applications of Skinner's analysis of verbal behavior with humans. *The Analysis of Verbal Behavior, 22*, 35–48.

Satcher, D. (1999). Mental health: A report of the surgeon general. U. S. Public Health Service. Bethesda, MD.

Sidman, M. (1994). Equivalence relations and behavior: A research story. Boston, MA: Authors Cooperative.

Sidman, M. (1971). Reading and auditory-visual equivalences. *Journal of Speech and Hearing Research, 14*, 5–13.

Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. New York: Appleton-Century

Skinner B. F. (1957). *Verbal Behavior*. New York: Appleton-Century-Crofts.

Skinner, B. F. (1958). "Teaching Machines." *Science, 129,* 969–977.

Smith, T., Eikeseth, S., Klevstrand, M., & Lovaas, O. I. (1997). Intensive behavioral treatment for preschoolers with severed mental retardation and pervasive developmental disorder. *American Journal on Mental Retardation, 102*, 238–249.

Smeets, P. M., & Striefel, S. (1994). A revised blocked-trial procedure for establishing arbitrary matching in children. *The Quarterly Journal of Experimental Psychology, 47B*, 241–261.

Wechsler, D. (2004). *Wechsler Intelligence Scale for Children—Fourth UK Edition.* London: Harcourt Assessment.

Wilkinson, L. A. (2008). Self-management for children with high functioning autism spectrum disorders. *Intervention in School and Clinic, 43*, 150–157.

Wulfert, E., & Hayes, S. C. (1988). Transfer of a conditional ordering response through conditional equivalence classes. *Journal of the Experimental Analysis of Behavior, 50*, 125–144.

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Developmental stage of performance in reasoning about school bullying

Christopher Joseph Joaquim

Nova Southeastern University

ABSTRACT

The Student-Bully Problem, an assessment of cognitive developmental stage adapted from Commons et al.'s (2006) Counselor-Patient Problem, was administered to 176 adolescent participants and 77 adult participants at an urban high school, urban middle school, and mid-size college ($N = 253$). This study investigated the following inquiries: At what cognitive developmental stages (as defined by the Model of Hierarchical Complexity) do urban high school and middle school students reason about bullying? How effective is the Student-Bully Problem at measuring cognitive developmental stage? Item and person Rasch scores were used to identify each participant's cognitive developmental stage of performance on the Student-Bully Problem, and to identify the item difficulty of the Student-Bully Problem's items. The Rasch analysis was also used to assess the validity and reliability of the Student-Bully Problem. Participants performed at the preoperational through metasystematic stages on the Student-Bully Problem. The Student-Bully Problem proved to be a useful tool in assessing cognitive developmental stage of performance in reasoning about bullying in school age youth. The Student-Bully Problem was modified with the goal of improving the instrument's effectiveness. Consequently, the Student Bully Problem (2.0) was created and administered to 116 urban high school students. Initial results (see discussion) indicate the modified version could be more effective

KEYWORDS: bullying, cognitive development, high schools, middle schools, peer harassment, stage theory

Over the last two decades, bullying has been a serious problem for public schools across the United States as well as globally (Coloroso, 2003; Felix & McMahon, 2006). Aside from having a significantly negative effect on students' academics, bullying can threaten the safety of school environments, as seen in many tragedies in the United States and around the world (Coloroso, 2003; Graham, 2006). In 1999, two reported victims of bullying killed 12 students, one teacher, and themselves at Columbine High School in Colorado. Statistics have shown a child is bullied every 7 minutes, and 80% of adolescents have reported being bullied. Bullying has been linked to depression, low self-esteem, and homicide. Merrell, Gueldner, Ross, and Isava (2008) found that bullying interventions (traditional bullying prevention programs) have modest positive outcomes, and do not have a significant effect on bullying behaviors in schools.

It is possible that a significant number of students respond to bullying in maladaptive ways, and that they do not respond positively to counseling because counseling interventions are not appropriate for the relevant cognitive developmental stages (or ability levels to reason about bullying) of students (Greene &Ablon, 2006). When discussing the effectiveness of counseling interventions for adolescents and children with anger management issues, Greene and Ablon (2006) stated that a

> *…child's difficulties are not due to a lack of motivation or to adult (counselor, parent, or teacher) ineptitude, but rather to a deficit in cognitive skills, and therefore programs based on rewarding and punishing are unlikely to achieve satisfactory results because incentive based programs do not train lacking cognitive skills, shifting cognitive set. (p. 30)*

Fajemidagba (1986) found that African adolescents might reach the stage of formal operations, but that the age of attainment can differ. The findings among Nigerian adolescents were similar to findings in Western cultures:

> *The implication of developmental stages for learning is that whatever a child is able to learn depends upon the child's level of cognitive functioning, competence to learn and the suitability of the learning or curriculum items. To assist students to move from a lower stage to the next higher stage of cognitive functioning, they must be confronted only with those curriculum*

Correspondence regarding this article should be addressed to Christopher Joaquim, EdD, MS, LMHC, 73 Prospect Avenue, Revere, MA 02151, Email: Joaquim@nova.edu

> *items which can be understood by them in their present stage and at the same time, the curriculum items must add to and challenge their modes of reasoning. (Fajemidagba, 1986, p. 26)*

A counseling approach where the same type of intervention is used for students of varying stages of cognitive development could result in a large number of cases of ineffective interventions. Rather, counselors should try to fit the intervention to the student's cognitive developmental stage.

In this study, bullying will be defined as physical, verbal, or psychological abuse, which occurs between students in the school setting (Juvonen, Nishina, & Graham, 2006). It is perpetrated by the bully with the deliberate intention of causing harm to the student victim of bullying (Solberg, Olweus, &Endresen, 2007). In order to qualify as bullying, the bully must possess more power than the bullied peer, and the bully must intend to do physical or psychological harm to the harassed peer (Coloroso, 2003, p. 13). The word *bullying*, as used in this paper, will be synonymous with the terms *peer harassment* and *peer victimization*.

Research questions

This study set out to investigate the following inquiries: At what stages of cognitive development (preoperational, primary, concrete, abstract, formal, systematic, or metasystematic) do urban high school and middle school students reason about bullying? How effective is the Student-Bully Problem at measuring cognitive developmental stage in adolescent students?

» REVIEW OF RELATED LITERATURE

Defining bullying

Horne, Stoddard, and Bell (2007) indicate that bullying is a subset of aggression, which is a typical problem found in schools, and acts of aggression might cause either physical or psychological harm. Coloroso (2003) defined bullying as a "conscious, willful, and deliberate hostile activity intended to harm, induce fear through the threat of further aggression, and create terror" (p. 13). Bullying includes an imbalance of power, the intention to harm others, threats of further aggressive acts, and terror. Furthermore, intimidation can be used by the bully to terrorize the student victim of bullying and to help the bully maintain a power imbalance (Coloroso, 2003). Olweus (as cited in Schuster & Maxmilian, 1996) identified bullying behaviors as repeated negative actions by one or more persons that are intentional attempts to hurt or make another person uncomfortable.

Types of bullying

Physical Bullying is the most obvious, observable form of bullying, and might manifest itself in a punch, kick, push, property destruction, throwing of an object, spitting, or in many other ways (Coloroso, 2003). Teasing/psychological bullying is a frequent part of routine social interactions, and could have an adaptive or maladaptive function. Keltner et al. (2001) defined teasing as "an intentional provocation accompanied by playful, off-record markers directed by one person toward another that comments on something of relevance to the target" (p. 229).

Socially excluding students from a peer group or from activities can be another form of bullying (MacDonald & Leary, 2005). Coloroso (2003) defined relational bullying as socially excluding, ignoring, isolating, or shunning others. The spreading of rumors or gossip about someone is categorized as relational bullying (p. 17). In Europe, relational bullying has even been documented in the workplace (Schuster &Maximilians, 1996).

Feinberg and Robey (2008) defined cyberbullying as the sending or posting of negative and cruel text as well as electronic images via the Internet. Whether it happens at school or off-campus, cyberbullying disrupts and affects all aspects of students' lives. Increasingly, students in this age group are setting up online profiles, such as on social networking sites (Enough Is Enough; as cited in Feinberg & Robey, 2008). Cyberbullying is increasingly convenient for students as some cellular phone providers make limitless text messaging and Internet access more affordable. Considering cellular phones are widely used by middle and high school students, it can be expected that cyberbullying will become more prevalent and convenient.

Effects of bullying

Littleton Colorado experienced the most extreme case of peer violence in 1999 when two high school students murdered 13 people at their high school, and then committed suicide. Six years later, in 2005, a high school student from Minnesota murdered five students, a security guard, his grandfather, and later committed suicide. It has been suggested that both of these events have links to bullying (Green, 2007). Garbarino and DeLara (as cited in Honig, 2002) conducted interviews with adolescents and found that bullying, peer harassment, intimidation, teasing, and threats exist in many schools and impede learning while creating an environment of fear. Further, these insidious behaviors at school can encourage students to dropout and increase the rate of deviant behaviors in a school. Garbarino and DeLara indicate that 160,000 students actively avoid their schools, and thousands drop out as a result of an overpowering fear of being bullied.

Bullying can be unpredictable and traumatic for student victims, which could facilitate anxiety and anxiety disorders. Mineka and Zinbarg (2006) note that a perceived lack of control and inability to predict stressful events can cause anxiety. Clearly, student victims of bullying might perceive a lack of control over the bully's actions, and find it difficult to predict when the bully will decide to carry out bullying behaviors. Also, it could be difficult for the student victim of bullying to predict what types of bullying behaviors the bully might carry out at a given time (Mineka & Zinbarg, 2006). "Unpredictability, novelty, low sense of control, and threat to the ego" are causes of stress (Plaford, 2006, p. 75). Both bullied girls and boys have reported being suicidal more than their nonbullied peers (Kerlikowske, 2003).

Farrell et al. (2006) discovered that the quantity of problem situations experienced by students in school has a positive relationship to aggression, delinquency, depression as well as anxiety, and has an inverse relationship to self-worth. Mrug et al. (2008) determined that 78.2% of adolescents in their study reported observing threats or violence in school, and 22.3% reported being a

student victim of threats or violence. Overall, 80% of adolescents reported some degree of exposure to violence in school while 34% reported some exposure in the community, and 13% indicated exposure at home (Mrug et al., 2008).

Cognitive developmental stage and stage theory

"To think, means, above all, to understand; and to understand means to arrive at the transformations, which furnish the reason for the state of things" (Piaget, 1961, p. 275). Theories of cognitive developmental stage and reasoning involve "…an ordered sequence of stages through which individuals progress as their reasoning matures" (Davison et al., 1980, p. 121). With regard to developmental stages of moral reasoning, Snarey, Reimer, and Kohlberg (1985) indicated that stage sequence should be invariant, move upward, progress gradually, be sequential, and not regress more than can be accounted for by expected scoring errors. As an individual progresses through stages, no stage should be skipped.

Hierarchical complexity and task difficulty

"Tasks are defined as sequences of contingencies, each presenting stimuli and requiring behaviors that must occur in some non-arbitrary fashion" (Commons & Miller, 2001, p. 226). Hierarchical complexity is a task property and one type of task difficulty. Generally speaking, hierarchical complexity has been described as the number of concatenation operations within a task. Concatenation is when two or more, lower-order tasks are nested within higher-order tasks. New task required actions are one order higher in complexity than the lower task required actions that they are derived or built from. (Commons & Miller, 2001).

Rasch analysis

The Rasch model is "…a well-established psychometric model that is particularly well-suited for examining patterns of performance in developmental data" (Dawson-Tunik et al., 2005, p. 164). When an individual develops a new concept, cognitively, hierarchical integration is involved, which is when a new concept is built (at a new level) through the coordination of conceptual elements from the previous level (Dawson-Tunik et al., 2005). A new concept is more hierarchically complex than an older concept because the newer concept integrates "…earlier knowledge into a new form of knowledge" (p. 165). Considering stages are successive hierarchical integrations, developmental stage sequence must progress without the omission of stages. The Rasch model examines "hierarchies of person and item performance, displaying both person proficiency and item difficulty estimates along a single interval scale (logit scale) under a probabilistic function" (Dawson-Tunik et al., 2005, p. 172). Rasch analysis can be used to analyze a unidimensional attribute, such as a specified type of human development, and it transforms ordinal data into interval data by calculating the natural logarithms of raw data (Bond & Fox, 2001).

The model of hierarchical complexity (MHC)

The MHC defines cognitive developmental stage as the performance required to accomplish a task of a specific order of hierarchical complexity as defined by the MHC (Commons et al., 1998). Using Rasch (1980) analysis, Commons, Goodheart, and Dawson (1995) found that hierarchical complexity of a given task (that is completed) predicts stage of a performance, the correlation being $r = .92$ (Commons et al., 2005).

The MHC defines 15 orders of hierarchical complexity (OHC) and the cognitive developmental stages that correspond to the OHC. Stages in the MHC (and their corresponding numbers of hierarchical complexity) are: calculatory stage (0), sensory and motor stage (1), circular sensory and motor stage (2), sensory-motor stage (3), nominal stage (4), sentential stage (5), preoperational stage (6), primary stage (7), concrete stage (8), abstract stage (9), formal operational stage (10), systematic stage (11), metasystematic stage (12), paradigmatic stage (13), and the (14) crossparadigmatic stage (Commons et al., 2005).

» METHODOLOGY

Participants

There were 176 adolescent and 77 adult volunteers in the Northeastern United States who participated in the author's dissertation research study in 2011. More specifically, adolescents from an urban school district, teachers from the same urban school district, and college professors and college students from the Northeastern United States participated in this research study. A convenience sample of adolescents enrolled in mainstream English classes was taken, and included: 6th- through 12th-grade students. However, 7th-grade students were omitted because they were not available at the time of the study. Mainstream English classes include students in college preparatory and higher level English classes. More precisely, students in each grade were enrolled in the following levels of English: college preparatory, honors, pre-advanced placement, and advanced placement. There were 86 female student participants, and 90 male student participants. Student participants had 19 countries of origin, and nine states of origin within the United States. Approximately 34% of student participants indicated English as their second language.

The student body at the urban school district is made up of: 4.4% African American students, 8.4% Asian students, 33.5% Hispanic or Latino students, 2.7% multiracial students, 0.7% Native American students, 0.1% Native Hawaiian or Pacific Islander students, and slightly under 50% White students. There are 51.3 % male students and 48.7% female students.

Adolescents were also selected from a junior high school in the same urban district, which contains 429 students, mostly ranging from 12 to 14 years of age. The student body consists of: 59.4% White students, 32.2% Hispanic or Latino students, 3.5% African American or Black students, 2.3% Asian students, 1.9% multiracial students, and 0.7% Native American students. Approximately 58% of students are classified as low-income students.

Instruments

Paying attention to the axioms and premises of the MHC, an instrument containing scored or staged vignettes was carefully adapted from the Counselor-Patient Problem (Commons, 2006) to assess cognitive developmental stage of performance in reasoning about bullying. First, the domain, general task, and purpose of the task were defined. Next, two groups of vignettes, and three sets of seven vignettes per group were created. Seven vignettes that

represented the seven cognitive developmental stages that were assessed in this research study were present in each set of vignettes, meaning each vignette was created to represent a single cognitive developmental stage and its corresponding order of hierarchical complexity (OHC) as defined by the MHC (Commons et al., 2005).

The adapted instrument, which includes different versions, was titled the Student-Bully Problem (SBP). Two groups (Assigned Seat & Pushing) of vignettes, with three sets of seven vignettes per group, were adapted for the purposes of this dissertation research study. The first adapted group of vignettes consisted of three slightly different sets of seven vignettes regarding an instance of covert or psychological bullying. Specifically, the bully takes another student's assigned seat. Students portrayed in each set of vignettes in this group are intended to demonstrate reasoning about bullying at varying orders of hierarchical complexity before reacting to the bullying. The second adapted group of vignettes also consists of three slightly different sets of seven vignettes involving an instance of bullying, but in this second group, the bullying is overt physical bullying. The bully pushes a student for no reason, and students described in the vignettes are intended to demonstrate reasoning about the bullying at varying orders of hierarchical complexity before reacting to the bullying.

When adapting the vignettes, many steps from Commons et al.'s (2005) Hierarchical Complexity Scoring System were followed. Domain is defined as performance in reasoning about school bullying. The general task is to read vignettes regarding student reasoning about school bullying (representing various cognitive developmental stages/OHC) and rate how well or poorly the student portrayed in each vignette reasons (on a Likert scale of 1–6). Purpose of the task is to identify the cognitive developmental stages that participants, in general, operate at when performing a reasoning task about school bullying (as defined by the MHC).

Each of the three sets of vignettes within a single group (Assigned Seat Group or Pushing Group) of the SBP varied slightly from the other sets within the group. Each vignette in a set represented a different level of hierarchical complexity and its corresponding cognitive developmental stage. Thus, each set contained vignettes representing seven orders of hierarchical complexity and their corresponding stages of cognitive development. The stages of cognitive development represented in the SBP differed slightly from the Counsleor-Patient Problem. More specifically, the preoperational stage was added to the SBP. This change was made because the Counselor-Patient Problem was used with adults while the SBP was mostly used with adolescents. The preoperational, primary, concrete, abstract, formal, systematic, and metasystematic stages defined by the Model of Hierarchical Complexity (Commons et al., 1998; Commons et al., 2006) were included in the SBP.

Like the Counselor-Patient Problem vignettes (Commons et al., 2006), the vignettes adapted for the SBP contain similar word counts (within five words), simple language, and brief sentences. Last names with the same letter count identify students in the vignettes, and the sex of the student is not revealed. Each vignette within a set has a similar lead in portion or beginning and a similar outcome or ending. The middle portion of the vignettes is varied to represent different orders of hierarchical complexity in reasoning about bullying and their corresponding cognitive developmental stages.

Structure of vignettes at each stage for the student-bully problem. When reading the description of how vignettes were structured at each particular stage (below), it is important to note the following: "c" represents a concrete instance or event, actor, place; "v" represents a variable; and "R" represents a relationship (or coordination).

Preoperational stage: order 6. At the preoperational order, minimal or no thought process precedes behavior. Simple, impulsive reactions follow social conflict. There is no capability for true counting (true counting is the ability to accurately attach number words to sets of randomly ordered objects). However, sets of ordered objects can be counted.

Primary stage: order 7. It is reality based, and a single perspective might be presented at one time. True counting, simple deduction, and simple one operation arithmetic and logic can be conducted.

Concrete stage: order 8. One may specify and talk about concrete instances, events, places, and actors (c_1, c_2, … these symbols represent specific events, places, or actors).

Abstract stage: order 9. Actual variables may be used at the abstract order. This means that words representing variations, such as "most," or other words representing something that varies can be used. Stereotypes and generalizations may be used. For example, a general group of people, like "teachers," might be referred to at this stage, as opposed to a reference to a specific person such as "my math teacher" (v_1, v_2, v_3…).

Formal stage: order 10. At the formal order, one relationship is operative ($v_n R_{n+1}$), and "If-then" logic may be used. Single variables outside of the relationship may be present.

Systematic stage: order 11. The systematic order consists of two or more relationships between variables, which form a system ($v_1 R_1 v_2$, $v_3 R_2 v_4$). Single variables may be present outside of these relationships between variables ($v_1 R_1 v_2$, $v_3 R_2 v_4$, v_5, v_6…).

Metasystematic stage: order 12. The metasystematic order consists of a relationship between two distinct systems, which are composed of relationships between variables. Single variables may be present outside of these relationships $\{(v_1 R_1 v_2)\ R_3\ (v_3 R_2 v_4), v_5, v_6\ldots\}$.

Commons et al. (2005) indicated that after vignettes are adapted or written according to the specifications set forth in the Hierarchical Complexity Scoring System, they should be piloted by having 30–50 participants rate the reasoning portrayed in each vignette on a rating scale of 1–6. Then, the data should be analyzed in a Rasch analysis to ensure that each vignette empirically represents

the intended order of hierarchical complexity. Overall, if the vignettes are ordered correctly, the Rasch analysis should show that the vignette with the highest order of hierarchical complexity (corresponding with the metasystematic stage in this case) is the most difficult for participants to order or to identify as the best reasoning. Conversely, most participants should order the vignette with the lowest order of hierarchical complexity (corresponding with the preoperational stage in this case) as the worst form of reasoning (Commons et al., unpublished).

Three versions of the Assigned Seat and Push groups of vignettes were created because errors or confounding variables in some of the vignettes (e.g., errors in writing or choice of vocabulary) could make it extremely difficult to identify problems with flawed vignettes. Creating several adapted versions of the instrument allows the researcher to "throw out" vignettes that are not representing their intended orders of hierarchical complexity after being piloted, modified, and piloted again. When the piloted items' (vignettes') orders of hierarchical complexity were regressed against the item difficulty (Rasch measures), sets of vignettes strongly supported the intended orders of hierarchical complexity (showing $r > .75$).

Procedure

Design. This research study is quantitative and descriptive in nature, and was designed to describe at what cognitive developmental stages urban middle school and high school students reason about bullying in school age youth. Two versions of the SBP instrument (Student-Bully Problem A, 1–1, 2–1 & Student-Bully Problem B, 1–2, 2–2) were administered to 6th through 12th-grade students (with the exception of 7th-grade students) in "mainstream" English classes. Additionally, junior high school teachers, high school teachers, college professors, and college students (from a midsize college in the Northeast) were administered the SBP. As suggested by Commons (personal communication, April 11, 2008), a relatively equal number of two slightly different versions of the SBP were distributed to participants in each administration group.

Parental consent and child/adolescent assent were attained, and the SBP instrument was administered to student participants. These participants were assigned one of the two versions of the instrument. The high school students who assented to participate in the study were assigned sequential subject identification numbers. The even assigned identification numbers were given the Student-Bully Problem (A, 1–1, 2–1) Survey, and the odd numbers were given the Student-Bully Problem (B, 1–2, 2–2) Survey. The survey was administered before classroom instruction began, and it took high school participants between 20 and 45 minutes to complete. The same process was repeated with middle school students.

At the start of the survey administration for middle and high school students, participants were given a paper copy of the SBP. Then, they were asked to complete a demographics page, and to stop upon completion of the demographics page. Once this was completed, they were asked to read the instructions and vignettes in the SBP Survey, and to answer all questions. Following completion, students handed in the SBP to the principal investigator who was present during the entire administration.

An informational e-mail about the study was sent to middle school and high school teachers along with a Survey Monkey link to the Student-Bully Problem Survey and the participation letter. The e-mail addresses of the teaching staff were acquired from the school district's administration, and the e-mail addresses were numbered. Those with odd subject numbers were sent a participation letter and a link to the Student-Bully Problem (A., 1–1, 2–1), which allowed them to anonymously submit answers via Survey Monkey. The same process was followed for teachers with even subject numbers, but they were given a link to Student-Bully Problem (B, 1–2, 2–2).

An informational e-mail about the study was sent to college professors and college students in a midsize college in the Northeast. The e-mail addresses of professors and students were acquired from the college administration. Each e-mail address on the list was assigned a number (consecutively). The e-mail contained a Survey Monkey link to the Student-Bully Problem Survey, including the participation letter. The e-mail addresses that were assigned an odd number were sent a link to the Student-Bully Problem (A, 1–1, 2–1), and the e-mail addresses that were assigned even numbers were sent the link to Student-Bully Problem (B, 1–2, 2–2). Answers were submitted anonymously via Survey Monkey. Adult participants took the survey at their convenience.

Rasch analysis

Participants' ratings of vignettes were coded in order to correctly associate each rating with the appropriate vignette, and set of vignettes (Assigned Seat or Push) from which the particular vignette belonged. Once all data were coded and organized in a matrix, a Rasch analysis (Bond & Fox, 2001; Linacre, 2009) was conducted. Rasch analysis obtains objective, fundamental, linear measures that are "… qualified by standard errors and quality-control fit statistics from stochastic observations of ordered category responses" (Commons et al., unpublished, p. 19). Logistic regression is used to minimize errors in item as well as person scores. Rasch analysis puts raw person and item scores on equal interval linear scales. Item scores are representative of item difficulty, and person scores are representative of a person's performance when dealing with an item of a particular difficulty (Commons et al., unpublished):

> *The linear measures created under the Rasch Model are item-free (item-distribution-free) and person-free (person-distribution-free). This means that the measures are statistically equivalent for the items regardless of which persons (from the same population) are analyzed, and for the people regardless of which items (from the same set) are analyzed. Analysis of the data at the response-level indicates to what extent these ideals are realized within any particular data set. The higher a person's performance score is relative to the difficulty of an item, the higher the probability of a correct response on that item by the participant. When a person's location on the latent trait is equal to the difficulty of the item, by definition, there is a 0.5 probability of a correct response. (p. 20)*

Table 1. Data matrix of participant ratings

Participants	Participant ratings						
Subject	**Preoperational**	**Primary**	**Concrete**	**Abstract**	**Formal**	**Systematic**	**Metasystematic**
S1a	3	2	5	4	3	3	3
S2a	1	2	3	6	4	6	6
S3a	1	2	4	6	4	4	5

Note. The subject ratings or numbers in Table 1 (under stage names) are from a 1–6 rating scale used by participants when rating vignettes. "1" represents worst reasons and "6" represents the best reasons. Ideally, low stage vignettes (like preoperational) would have lower ratings while high stage vignettes (like metasystematic) would have higher ratings.

Stage scores

After the person and item Rasch scores were derived from the Rasch analysis, item and person stage scores (as defined by the Model of Hierarchical Complexity) were calculated. This was done because "…the mean and standard deviation of a Rasch item score or a Rasch person score are not fixed in the same way the order of hierarchical complexity and stage are fixed" (Commons et al., unpublished, p. 21). Rasch scale parameters were transformed in order to ensure "their scale conformed" to the scale that stage is measured on when defined by the MHC. More specifically, the MHC measures stage on a scale from 0 through 14 where each number represents a distinct, hard stage.

The intended hierarchical complexity of each vignette was put in a regression analysis with the item Rasch score of each vignette. If the intended order of hierarchical complexity was correct, then the item Rasch score should be in agreement with the vignette's intended order of hierarchical complexity. For example, the item Rasch score representing the most difficult item should highly correlate with the highest ordered or staged vignettes (12th order of hierarchical complexity/metasystematic stage in this research study), and conversely, the lowest item Rasch score should highly correlate with the lowest ordered or staged vignette (6th order of hierarchical complexity/preoperational stage in this research study). The extent to which the item Rasch scores were in agreement with the vignettes' intended orders of hierarchical complexity defined validity and reliability of the SBP's items. It was expected that the adapted instrument in this study would prove highly valid and reliable since the Counselor-Patient Problem instrument (Commons et. al, 2006), which it was adapted from, proved highly valid and reliable. Since Rasch analysis measures person performance as well as item difficulty (Bond & Fox, 2001), the analysis also revealed how participants performed on the task of rating how well or poorly students portrayed in the vignettes reasoned about bullying.

The researcher used an assessment based on the Model of Hierarchical Complexity stage theory because it is quantitative in nature and could be adapted to the relevant area of study: bullying. Therefore, the instrument did not determine cognitive developmental stage based on physics tasks or other arbitrary tasks. This instrument was limited to assess how students performed on a reasoning task about bullying. Knowing how students reason in other contexts, such as physics or in more general contexts, might be helpful to counselors addressing bullying issues, but it should be more helpful to know at what cognitive developmental stages students, in general, reason about bullying.

» RESULTS

Coding the data

The collected data were coded, so responses to SBP (a) could be distinguished from responses from SBP (b). Additionally, data were coded, so data from Assigned Seat vignettes could be distinguished from data from Push vignettes. A data matrix was created to organize all participant ratings with their corresponding vignettes and their intended OHC (see Table 1).

The column headings above participant ratings in Table 1 represent the intended stage/order of hierarchical complexity (OHC) of Assigned Seat items. In order to differentiate Push items from Assigned Seat items, ratings for Push items were listed below the following headings: Preoperational 2, Primary 2, Concrete 2, Abstract 2, Formal 2, Systematic 2, and Metasystematic 2 (2 indicating Push items). This specific organization of the data prepared it to become input for a Rasch analysis with Winsteps Software.

Rasch analysis with student data

Data from this research study were analyzed in several different ways (student data only, student and adult data together, and adult data only). Student data was analyzed separately from adult data in order to identify how the Student-Bully Problem performed when solely administered to students; consequently, Rasch analysis of student data is reported here. All of the student data (6th through 12th grade) from the Assigned Seat vignettes were analyzed in one Rasch analysis, and all of the student data from the Push vignettes were analyzed in a second Rasch analysis. Following the Rasch analysis, output tables were created with Winsteps software to illustrate item difficulty and person performance. The rank measure tables for the Assigned Seat and Push data were produced to illustrate item difficulty on the Rasch scale. The person measure tables were produced to show person performance on the Rasch scale. Item and person Rasch scores were used to calculate person and item stage (as defined by the MHC), which is described later in the results section.

Reliability of the Rasch analysis

Rasch analysis is useful because it calculates person performance as well as item difficulty on a single continuum. Person performance measures are more reliable when it is highly probable that persons with higher Rasch measures are actually higher performers than those with lower Rasch measures. Item difficulty measures are more reliable when it is highly probable that items with higher Rasch measures are actually more difficult than those with the lower Rasch measures. In order to achieve high item reliability, you

Table 2. Item stage scores

	Preop.	Prim.	Conc.	Abs.	Formal	Syst.	Metasyst.
Intended order of HC	6	7	8	9	10	11	12
Assigned seat stage of item score	5.66	9.25	8.08	9.4	9.8	11.82	11.89
Push stage of item score	6.34	4.75	7.92	8.64	10.17	10.12	12.11

need a test with a large item difficulty range and/or a large sample of persons (Linacre, 2010). Rasch analysis output showed that data collected from Assigned Seat vignettes had a person reliability of 0.48, and an item reliability of 0.98. The person reliability of the data gathered from the Push vignettes was 0.71, and the item reliability was 0.96. Linacre (2010) indicated that approximately 0.70 and higher is adequate for person reliability. Different circumstances, such as a small number of items or a limited participant sample might decrease person reliability. Person reliability seemed relatively low for the Assigned Seat vignettes, but adequate for the Push vignettes. Lower person reliability could be caused by the small number of items in the SBP or by the limited participant population, which was from two schools in a single school district; adding items to the SBP might increase person reliability. The item reliability was quite high, which indicated that the item Rasch score (taken from the rank measure table in Winsteps) accurately reflected the difficulty of an item. However, some of the items were out-of-order, which was demonstrated when the item difficulty (item Rasch score) of some items (vignettes) was higher or lower than expected considering the intended OHC of those items. This likely indicated the intended OHC of some of the items was not adequately achieved. Item Rasch scores are discussed further in the person stage section of the results.

Stepwise regression

Rasch item scores were regressed against the items' intended OHC. One regression was conducted for the Assigned Seat vignettes and another was conducted for the Push vignettes. OHC was set as the independent variable, and Rasch item score was set as the dependent variable in the linear regression, which was conducted with SPSS software. With the Assigned Seat vignettes, OHC was shown to be a significant predictor of Rasch item score or item difficulty. More specifically, the results of the linear regression showed the following: $r = .877$, $r^2 = .77$, $p < .05$. With respect to the Push vignettes, it was also shown that OHC was a significant predictor of Rasch item scores, as the linear regression results showed: $r = .872$, $r^2 = .712$, $p < .05$.

After running the regression analyses, scatter plots with best-fit lines were generated. The scatter plot for Assigned Seat vignettes shows that the abstract (OHC 9) and primary (OHC 7) vignettes are substantially more difficult (or complex) than intended. Similarly, the scatter plot for the Push vignettes shows the abstract vignette is significantly more difficult (or complex) than intended.

Item stage scores

Item stage scores were calculated from the item Rasch scores by using the item stage formula defined by the MHC (Commons et al., unpublished). In the item stage formula shown below, Stage Mean_1 is the mean of item Rasch scores representing items at the single OHC being scored for item stage, and Stage Mean_2 is the mean of item Rasch scores representing items at the single OHC immediately higher than the item being scored. For example, if the preoperational item is being scored, then the mean of preoperational items' Rasch scores is Stage Mean_1, and the mean of the primary items' Rasch scores is Stage Mean_2. In this case, there were only two items to average at each order of hierarchical complexity (Assigned Seat & Push). For example, there was an item Rasch score for the preoperational Assigned Seat item, and a Rasch item score for the preoperational Push item. Item Rasch Score is the item Rasch score of the specific item for which Stage of Item is being calculated. "Item HC" refers to the intended order of hierarchical complexity of the relevant item. Item stage scores are compared to the intended OHC and their corresponding stages of cognitive development in Table 2. The stage of an item is calculated with the following formula (Commons et al., unpublished):

$$\text{Stage of Item} = \frac{\text{Item Rasch Score} - \text{Stage Mean}_1}{\text{Stage Mean}_2 - \text{Stage Mean}_1} + \text{Item HC}$$

Person stage scores

Each participant's stage, as defined by the MHC (Commons et al., 1998) was calculated with the following formula (Commons et al., unpublished):

$$\text{Stage of Person} = \frac{\text{Person Rasch Score} - \text{Stage Mean}_1}{\text{Stage Mean}_2 - \text{Stage Mean}_1} + \text{Item HC}$$

Person stage was calculated once with Rasch analysis output from the Assigned Seat data, and a second time with Rasch analysis output from Push data. Thus, person stage calculation did not actually require the calculation of a mean because there was only one item Rasch score at a single OHC for Assigned Seat vignettes, and there was only one item Rasch score at a single OHC for Push vignettes. Consequently, in this study, Stage Mean_1 equals Stage_1 (or item Rasch score 1), and Stage Mean_2 equals Stage_2 (or item Rasch score 2).

Ideally, the item Rasch score for each item/vignette would represent the intended OHC of that item/vignette and create linearity of stages. When this ideal is achieved, the Rasch analysis of data should produce decreasing item Rasch scores that are ordered from the lowest intended OHC to the highest intended OHC – without the mixing of orders. It is important to remember that the item at the lowest OHC should have the highest Rasch score, as the highest Rasch score indicates the least item difficulty. This linearity, or ideal of item Rasch scores representing items' intended OHC, is necessary to calculate person stage scores. If there is mixing of stages/OHC, some items must be collapsed into multistage items to establish the linearity needed to calculate person stage. If stage mixing demonstrates most items'

Table 3. Assigned seat vignettes with collapsed multistage items

Assigned seat item Rasch score	OHC	Stage name
1.02	6	Preoperational
0.08	7-8	Primary-concrete
-0.07	9-10	Abstract-formal
-0.46	11	Systematic
-0.6	12	Metasystematic

intended OHC was not achieved, then it would be impossible to create linearity by collapsing some items into one or more multistage items. In this research study, there was some mixing of item OHC. However, item Rasch scores represented the items' intended OHC to a degree allowing for collapsing of out-of-order items into multistage items, which created the linearity of orders necessary to calculate person stage scores.

Person stage scores for student assigned seat data

Rasch scores indicated that some of the items were out of order, which broke up the intended linearity of staged items. However, creating a few multi-stage items restored linearity, which is necessary when calculating person stage scores. The primary and concrete items had to be collapsed into a multistage item (Primary-Concrete), and the abstract and formal items had to be collapsed into a multistage item (Abstract-Formal). Transforming two items into a multistage item restored the ideal linearity with intended item orders of hierarchical complexity, but it made it impossible to assess primary, concrete, abstract, and formal items individually as intended. Consequently, results and calculations regarding these stages were less specific than desired, but still useful. A collapsed multistage category was created by averaging the participants' raw ratings that corresponded with the staged/ordered items being collapsed into one multistage category. Participants rated items with a 1–6 rating scale, so some of the ratings had to be rounded up or down, as the rating representing the multistage category had to be 1, 2, 3, 4, 5, or 6 and could not be any other number. In order to create a multistage category for the concrete and abstract stage items with a participant's data, the concrete and abstract ratings were averaged. For example, the ratings 5 (for the concrete item) and 4 (for the abstract item) were averaged to 4.5, and then the average was rounded to 5 (representing the "concrete-abstract" multistage). Abstract and formal items were also collapsed into a multistage item in the example below. The item headings of the multistage categories indicate the rating under the heading represents two different stages and not just a single stage item (see Table 3).

Table 4. Push vignettes with multistage categories

Push item Rasch scores (with multistage categories)	Push OHC	Stage name
0.69	6	Preoperational
0.28	7	Primary
0.16	8	Concrete
-0.52	9-10	Abstract-formal
-0.60	11-12	Systematic-metasystematic

Table 5. Reliability with multistage categories (for student data)

Reliability of assigned seat and push data with collapsed multistage categories	Person reliability	Item reliability
Assigned seat	.39	.99
Push	.59	.98

After the out-of-order items were collapsed into multi-stage categories, another Rasch analysis was conducted, and its output displayed the linearity necessary to calculate person stage (see Table 3).Using the person stage formula listed earlier in this section, person stage was calculated for each participant whom at least received a person Rasch score equal to the lowest order item (Pre-operational: OHC 6). Some participants' scores were less than the lowest order item and had to be eliminated (Richards, personal correspondence). It was possible to calculate person stage for 168 participants, and eight participants were excluded, as their person Rasch scores did not fit the model (falling below the preoperational item Rasch score). It was found that 21 participants performed at the preoperational stage, 88 participants (in total) performed at the primary and concrete stages, 28 (in total) performed at the abstract and formal stages, 20 performed at the systematic stage, and 11 performed at the metasystematic stage.

Person stage scores and student push data

Next, person stage was calculated from the Push vignette data. Transforming these items into multistage items restored the ideal linearity, but it made it impossible to assess abstract, formal, systematic, and metasystematic items individually, as intended. Therefore, results and calculations regarding these stages were less specific than desired, but still useful. A collapsed multistage category was created by averaging the raw ratings of participants for the items being collapsed into one multistage category, as with the out-of-order Assigned Seat items. After the stages were collapsed into multistage categories, another Rasch analysis was conducted, and its output displayed the linearity necessary to calculate person stage (see Table 4).

The number of participants for whom person stage could be calculated varied slightly from the Assigned Seat data, as some different participants had a person Rasch score below the preoperational item Rasch score. Person stage could not be calculated for 14 participants, which left a total of 159 participants whose person stage could be calculated. Four participants were at the preoperational stage, 13 were at the primary stage, 25 were at the concrete stage, 49 participants (in total) were at the abstract and formal stages, and 68 (in total) were scored at the systematic and metasystematic stages.

Stepwise regression with collapsed multistage categories

After the mixed or out-of-order stages were given linearity via the collapsing of multiple stages, which were out-of-order, it was possible to view how the data should look, ideally, when vignettes represent the correct orders of hierarchical complexity (Appendix C). When the Assigned Seat vignettes with multistage categories were regressed against item Rasch scores, the results

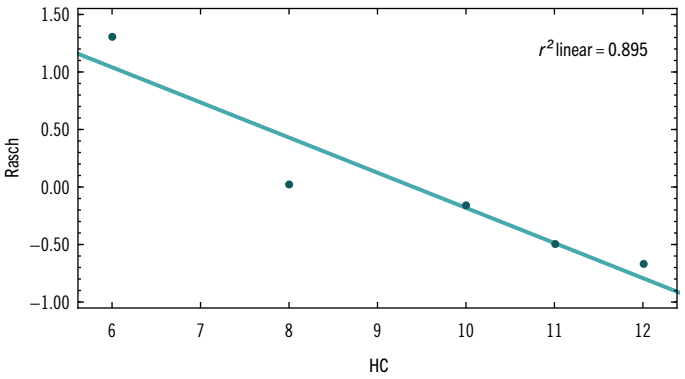


Figure 1. Assigned seat linear regression scatter plot with multistage categories

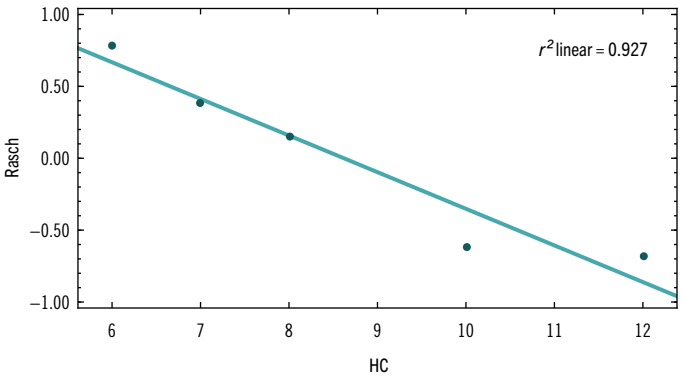


Figure 2. Push linear regression scatter plot with multistage categories

showed: $r = .946$, $r^2 = .895$, $p < .05$ (see Figure 1). The Push intended orders of hierarchical complexity (including multistage categories) were regressed against item Rasch scores and results showed: $r = .963$, $r^2 = .927$, $p < .05$ (see Figure 2). Table 5 illustrates the person and item reliability of Assigned Seat and Push data with collapsed multistage categories.

Similar to with the Assigned Seat data, when person stage scores were calculated from the Push data, single stage and multistage person stage scores were grouped in a linear fashion without much mixing.

Student Rasch variable maps for assigned seat

After a Rasch analysis for student participants was conducted for Assigned Seat and Push vignette data (with multistage categories), and person stage scores were calculated, two variable maps were produced (with Winsteps) in order to illustrate where person stage scores were placed on the Rasch scale in comparison to items. The first variable map showed where students' person stage scores calculated from Assigned Seat data fell on the Rasch scale in comparison to the items (see Figure 1 in Appendix C). This variable map made it clear that after out-of-order items were combined into multi-stage categories (primary-concrete; abstract-formal), person stage scores were distributed without much mixing of stages/orders of hierarchical complexity. Preoperational person stage scores were grouped together near the end of the Rasch scale indicating lowest item difficulty, and they were followed by the primary-concrete multistage person stage scores. Next, the Abstract-formal multistage person stage scores were grouped together. Then, the systematic person stage scores were grouped together, and finally, the metasystematic person stage scores were grouped at the end of the Rasch scale representing highest item difficulty. There was slight mixing of person stage scores, as one Primary-Concrete person stage score fell before the preoperational person stage scores, and two systematic person stage scores fell after the metasystematic person stage scores. Single stage and multistage items were ordered in a linear fashion from least to most item difficulty (preoperational through metasystematic) as expected given the item orders of hierarchical complexity.

Student Rasch variable map for push

Similar to with the Assigned Seat data, when person stage scores were calculated from the Push data, single stage and multistage person stage scores were grouped in a linear fashion - without much mixing. Preoperational person stage scores were grouped at the end of the Rasch scale representing low item difficulty, and the highest person stage scores were grouped at the end of the Rasch scale representing high item difficulty in a linear fashion (see Figure 2 in Appendix C). With the Push data, the highest person stage score was a person multistage score (systematic-metasystematic).

» DISCUSSION

Student-bully problem effectiveness

The Student-Bully Problem (SBP) Assigned Seat items proved to be effective in assessing at what cognitive developmental stages adolescents performed at on a reasoning task about bullying. Person stage scores were distributed in a logical manner considering the age of the participants (Commons et al., 1998). The majority of participants were scored at stages between primary and formal, and a minority of participants was scored at the highest and lowest stages. Further, person stage scores seemed to be logically distributed in a linear fashion along the Rasch scale variable map (Appendix C). However, the Assigned Seat items could have been more effective. Considering this was the first study using the Student-Bully Problem, it was expected that the items would not be as effective and refined as possible since they were not used and analyzed in prior studies. The item Rasch scores clearly showed that the primary and abstract ordered Assigned Seat items did not represent their intended orders of hierarchical complexity in this study. Even with these two out-of-order items, order of hierarchical complexity (OHC) was a significant predictor of item Rasch score ($r = .877$, $r^2 = .77$, $p < .05$).

Rasch analysis output showed that data collected from Assigned Seat items had a person reliability of 0.48, and an item reliability of 0.98. The relatively low person reliability could, in part, be attributed to the small number of Assigned Seat items (7 in total), but person reliability might have improved if the primary and abstract items better represented their intended orders of hierarchical complexity. Revisions that could improve

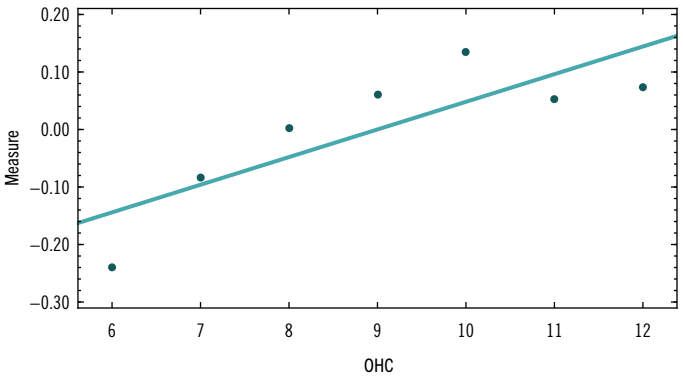


Figure 3. SBP 2.0 (a) & SBP 2.0 (b) Pushing the bully $r = 0.83$

Note. In Figure 3. "Measure" is "item Rasch score," and "OHC" is "order of hierarchical complexity." In this figure, a lower measure/item Rasch score corresponds to lower item difficulty and lower OHC. The preoperational stage has an OHC of 6, primary stage has an OHC of 7, concrete stage has an OHC of 8, abstract stage has an OHC of 9, formal stage has an OHC of 10, systematic stage has an OHC of 11, and metasystematic stage has an OHC of 12.

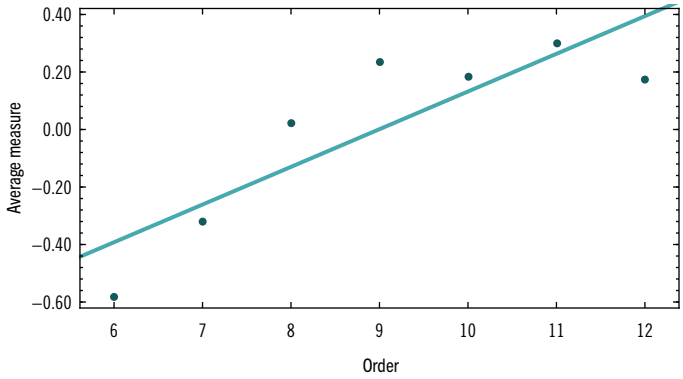


Figure 4. SBP 2.0 (a) & SBP 2.0 (b) Assigned seat $r = 0.86$

Note. In Figure 4 "Measure" is "item Raschscore," and "Order" is "order of hierarchical complexity." In this figure, a lower measure/item Rasch score corresponds to lower item difficulty and lower OHC.The preoperational stage has an OHC of 6, primary stage has an OHC of 7, concrete stage has an OHC of 8, abstract stage has an OHC of 9, formal stage has an OHC of 10, systematic stage has an OHC of 11, and metasystematic stage has an OHC of 12.

the Assigned Seat items are discussed later. Rasch output showed that item reliability was very high, meaning the estimated item difficulty of each item (ordered for hierarchical complexity) was highly accurate.

The Student-Bully Problem's Push items consisted of some items that performed well, but overall, the push items did not seem to assess participants as well as the Assigned Seat items. This was evidenced in the Rasch variable map for Push items (see Figure 2 in Appendix C), which displayed most participants at the highest stages. Given that an adolescent population was assessed, this result was not expected and could not be explained. Most participants should have been somewhere between the concrete and formal stages while either a minority of participants or no participants at all would have been expected to be scored at the lowest and highest stages. The person reliability of the data gathered from the Push vignettes was 0.71, and the item reliability was 0.96. Since Linacre (2010) indicates that approximately 0.70 and higher is adequate for person reliability, this seems like a good indication, but the issue here was that some Push items were out-of-order, and the higher stage items, in particular, seemed to be at a lower OHC than intended. The out-of-order items detracted from the good person reliability indicated by the Rasch output, as person reliability was partly based on person performance on items that did not represent their intended orders of hierarchical complexity. Order of hierarchical complexity was a good predictor of item Rasch score with Push items ($r = .872$, $r^2 = .712$, $p < .05$), but when considering that the systematic and metasystematic item represented lower OHC than intended, this significant relationship was not as meaningful as it seemed. However, it does indicate that if Push items are revised in a manner allowing them to better represent their intended OHC, then OHC should be a highly significant predictor of item Rasch score. The abstract item seemed to be the farthest from its intended OHC; it showed a much higher item Rasch score than expected, which was almost the same as the metasystematic stage item. There will be further discussion about specific Push items later in this section.

Student-bully problem 2.0 (SBP 2.0)

Based on analysis of the researcher's dissertation data described earlier, the Student-Bully Problem (SBP) was modified (SBP 2.0), and a research study was conducted in the spring of 2012 to assess the newly revised instrument. Since the Student-Bully Problem originally only had one item corresponding with each staged / ordered vignette, reliability could have been unnecessarily compromised. Consequently, the revised SBP (SBP 2.0) has five questions corresponding with each staged/ordered vignette. Vignettes were rewritten (see Appendix D) to correct some problems identified with the dissertation research, and also to make the vignettes more "user-friendly" to the reader. Since questions were added for each vignette, question content changed. The new questions corresponding to each vignette are:

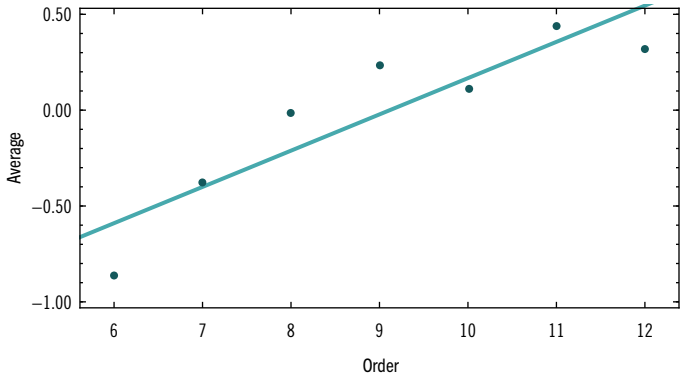


Figure 5. SBP 2.0 (b) Assigned seat $r = 0.90$

Note. In Figure 5 "Measure" is "item Raschscore," and "Order" is "order of hierarchical complexity." In this figure, a lower measure/item Rasch score corresponds to lower item difficulty and lower OHC.The preoperational stage has an OHC of 6, primary stage has an OHC of 7, concrete stage has an OHC of 8, abstract stage has an OHC of 9, formal stage has an OHC of 10, systematic stage has an OHC of 11, and metasystematic stage has an OHC of 12.

- How smart is (insert name) for saying this and acting this way?
- How much do you trust (insert name) to help you with a bully?
- How much do you look up to (insert name) for saying this and acting this way?
- How much trouble will (insert name) get in for saying this and acting this way?
- How much will the other student hate (insert name) for saying this and acting this way?

The SBP 2.0 vignettes are included in the appendix (Appendix D), and can be compared to the original SBP (Appendix A, Appendix B).The SBP 2.0 was administered to 116 urban high school participants from grades 9–12 (in the Northeastern United States) in the spring of 2012. A convenience sample was used and student participants were all in "mainstream" English classes. The demographics were similar to those reported for the dissertation research study. The SBP 2.0 was administered online (in classrooms) via Survey Monkey.

The results indicate it could be more effective than the original SBP, and provide further support that the SBP vignettes' OHC is a good predictor of item difficulty / Rasch measures. Scatter plots (see Figure 3 and Figure 4) show the intended order of hierarchical complexity of an item in the SBP 2.0 is a good predictor of item Rasch score or item difficulty. SBP 2.0 (a) and SBP 2.0 (b)'s "student pushing" vignettes demonstrated $r = .83$ when items' Rasch scores were regressed against the corresponding items' orders of hierarchical complexity / stage (see Figure 3). When a similar regression analysis was conducted for SBP 2.0 (a) and SBP 2.0 (b) "assigned seat," it was found that $r = .86$ (see Figure 4). The regression analysis carried out for SBP 2.0(b) "assigned seat" showed that $r = .90$ (see Figure 5).

Limitations

Clearly, there were limitations placed on the dissertation research study by the Student-Bully Problem survey that was used to collect data. Specifically, Rasch analysis demonstrated that some of the items did not represent their intended OHC. As a result, some items could not be differentiated from other items and were grouped together as a multistage item. This allowed for the linearity (of OHC) among items that was necessary to calculate person stage scores, but some of the stage scores were necessarily multistage scores, meaning that a person might have been scored Primary-Concrete. Primary-Concrete stage would simply indicate that the person was scored at either the Primary or Concrete stage, but the specific individual stage the person scored at could not be identified. Understanding the range of stages a person might be scored at can be useful, but the hope was that the Student-Bully Problem would identify precisely what individual stage of cognitive development a participant performed at on this task.

The revised version of the SBP, the SBP 2.0, supports the original version (as it is an adaptation of the original version / SBP), but performs better and holds more promise. It will be beneficial to collect and analyze more data with the SBP 2.0 to determine if it is a more effective or useful developmentally based instrument than the original SBP. ■

REFERENCES

Bond, T.G., & Fox, C.M. (2001).Applying the Rasch model. Mahwah, NJ: Lawrence Erlbaum Associates.

Coloroso, B. (2003). *The bully, the bullied, and the bystander*. New York, NY: Harper Collins.

Commons, M.L. (2007). Changing stage for students, teachers and schools. *Behavioral Development Bulletin*, *13*(Spring), 30–34.

Commons, M.L., Miller, P.M., Goodheart, E.A., & Danaher-Gilpin, D. (2005). Hierarchical complexity scoring system (HCSS): How to score anything. Cambridge, MA: Dare Association.

Commons, M.L., & Pekker, A. (unpublished). *Hierarchical complexity and task difficulty*. Available from Dare Institute, Cambridge, MA.

Commons, M.L., Richardson, M.R., Pekker, A., Ali, I.M., Bernholt, S., Davidson, M. Grotzer, T.A. (unpublished). *How order of hierarchical complexity of items, content and language affect synchrony of performance on isolation of variables problem*. Available from Dare Institute, Cambridge, MA.

Commons, M.L., Rodriguez, J.A., Adams, K.M., Goodheart, E.A., Gutheil, T.G., & Cyr, E.D. (2006). Informed consent: Do you know it when you see it? *Psychiatric Annals*, *36*(6), 430–435.

Commons, M.L., Trudeau, E.J., Stein, S.A., Richards, F.A., & Krause, S.R. (1998). Hierarchical complexity of tasks shows the existence of developmental stages. *Developmental Review*, *18*, 237–278.

Davison, M.L., King, P.M., Kitchener, K.S., & Parker, C.A. (1980).The stage sequence concept in cognitive and social development. *Developmental Psychology*, *16*(2), 121–131.

Dawson-Tunik, T.L., Commons, M., Wilson, M., & Fischer, K.W. (2005).The shape of development. *European Journal of Developmental Psychology*, *2*(2), 163–195.

Evans, G.D., & Rey, J. (2001). In the echoes of gunfire: practicing psychologists' responses to school violence. *Professional Psychology: Research and Practice*, *32*(2), 157–164.

Fajemidagba, O. (1986). A study of the Piagetian levels of cognitive development among Nigerian secondary school students. *Ilorin Journal of Education*, *6*(1), 17–29.

Farrell, A.D., Sullivan, T.N., Kliewer, W., Allison, K.W., Erwin, E.H., Meyer, A.L., & Esposito, L. (2006). Peer and school problems in the lives of urban adolescents: frequency, difficulty, and relation to adjustment. *Journal of School Psychology*, *44*(3), 169–190.

Feinberg, T. & Robey, N. (2008). Cyberbullying. *Principal Leadership*, 9, 10–14.

Felix, E.D. & McMahon, S.D. (2006). Gender and multiple forms of peer victimization: How do they influence adolescent psychosocial adjustment? *Violence and Victims*, *21*(6), 707–724.

Graham, S. (2006). Peer victimization in school. *Current Directions in Psychological Science*, *15*, 317–321.

Green, G. (2007). Bullying: A concern for survival. *Education*, 128, 333–336.

Greene, R.W., & Ablon, S.J. (2006).*Treating explosive kids: The collaborative problem-solving approach.* New York, NY: The Guilford Press.

Honig, A.S. (2002). High schools can be toxic. *American Journal of Orthopsychiatry*, *72*, 456–459.

Horne, A.M., Stoddard, J.L., & Bell, C.D. (2007). Group approaches to reducing aggression and bullying in school. *Group Dynamics: Theory, Research, and Practice*, *11*, 262–271.

Inhelder, B. & Piaget, J. (1958).*The growth of logical thinking from childhood to adolescence*. New York, NY: Basic Books.

Keltner, D., Capps, L., Kring, A.M., Young, R.C., & Heerey, E.A. (2001). Just teasing: A conceptual analysis and empirical analysis and empirical review. *Psychological Bulletin*, *127*, 229–248.

Linacre, J.M. (2009). *Winsteps: Multiple-choice, rating scale and partial credit Rasch analysis*. Chicago, IL: Mesa Press.

Linacre, J.M. (2010). A User's Guide to WINSTEPS / MINISTEP Rasch-Model Computer Programs (Program Manual 3.69.1).

MacDonald, G., & Leary, M.R. (2005). Why does social exclusion hurt? The relationship between social and physical pain. *Psychological Bulletin*, *131*, 202–223.

Malecki, C.K., & Demaray, A. (2006).Social support as a buffer in the relationship between socioeconomic status and academic performance. *School Psychology Quarterly*, *21*, 375–395.

Merrell, K.W., Gueldner, B.A., Ross, S.W., & Isava, D.M. (2008). How effective are school bullying intervention programs? A meta-analysis of intervention research. *School Psychology Quarterly*, *23*(1), 26–42.

Mineka, S., & Zinbarg, R. (2006). A contemporary learning theory perspective on the etiology of anxiety disorders. *American Psychologist*, 61(1), 10–26.

Mrug, S., Loosier, P.S., & Windle, M. (2008). Violence exposure across multiple contexts: Individual and joint effects on adjustment. *American Journal of Orthopsychiatry*, *78*(1), 70–84.

Piaget, J. (1961). The genetic approach to the psychology of thought. *Journal of Educational Psychology*, *52*, 275–281.

Plaford, G.R. (2006). *Bullying and the brain*. Lanham, Maryland: Rowman & Littlefield.

Schuster, B., & Maximilians, L. (1996).Rejection, exclusion, and harassment at work and in schools. *European Psychologist, 1*(4), 293–317.

Snarey, J.R., Reimer, J., & Kohlberg, L. (1985). Development of social-moral reasoning among Kibbutz adolescents: A longitudinal cross-cultural study. *Developmental Psychology*, *21*, 3–17.

Solberg, M.E., Olweus, D., & Endresen, I.M. (2007). Bullies and victims at school: Are they the same pupils? *British Journal of Educational Psychology*, *77*, 441–464.

» APPENDIX A

Student-bully problem (A, 1–1, 2–1)

The problem: A student leaves class to go to the bathroom. When getting back to class, another student is sitting in the student's seat. The student who went to the bathroom was assigned that seat by the teacher and used the seat all year. The following stories have students who deal with this problem the same way. But, *the reasons they have for how they deal with the problem are different*.

Directions: First, read all seven stories carefully. Then, read each story again and rate how good or bad the students' reasons are for how they deal with the problem. It does not matter if you agree with how the student deals with the problem. *You are only rating how good or bad the students' reasons are for how they deal with the problem.*

Kents is surprised the other student took Kents' seat. The other student ignores Kents. Kents wants the other student to move as soon as possible. Students have their own assigned seats for the whole school year. Kents tries to push the other student out of the seat. Kents failed to move the other student. Kents tells the teacher what happened.

Birch is surprised the other student took Birch's seat. The other student ignores Birch. Birch thinks about pushing the other student out of the seat. Pushing other students breaks school rules. If students break the rules, they will be punished. If Birch pushes the other student out of the seat, Birch will be punished. Birch tells the teacher what happened.

Moore is surprised the other student took Moore's seat. The other student ignores Moore. Moore thinks about pushing the other student out of the seat. Moore's friends had told Moore stories of how they got their seats back by telling the teacher what happened. Moore wants to try that, and hopes it will work. Moore tells the teacher what happened.

Stowe is surprised the other student took Stowe's seat. The other student ignores Stowe. Stowe thinks about pushing the other student out of the seat. Good students do not push other students at school. Only bad students push other students in school. The good students always report problems to an adult working in the school. Stowe tells the teacher what happened.

Riley is surprised the other student took Riley's seat. The other student ignores Riley. Riley screams and yells out loud at the other student to get out of the seat. Riley cannot push the other student out of the seat. Riley wants the seat back right away. The teacher is on the other side of the classroom. Riley tells the teacher what happened.

Green is surprised the other student took Green's seat. The other student ignores Green. Green thinks about pushing the other student. Pushing the other student breaks the school rules. Rules are made so students do not get hurt. Pushing a student could hurt that student and get Green in trouble for breaking the rules. Green tells the teacher what happened.

Smith is surprised the other student took Smith's seat. The other student ignores Smith. Smith considers what the other student would think if Smith stole a seat. If Smith broke the seating rule, Smith thinks it would violate another student's rights and the other student would find it fair if the teacher punished Smith. Smith wants to handle this problem fairly. Smith tells the teacher what happened.

Rate how good or bad the students' *reasons* are for how they deal with the problem by circling a number from 1 to 6. Circling "1" means you think the student had the worst reasons. Circling "6" means you think the student had the best reasons. All of the ratings do not need to be used and the same rating can be used for more than one student.

Kents	Worst reasons	1 2 3 4 5 6	Best reasons
Birch	Worst reasons	1 2 3 4 5 6	Best reasons
Moore	Worst reasons	1 2 3 4 5 6	Best reasons
Stowe	Worst reasons	1 2 3 4 5 6	Best reasons
Riley	Worst reasons	1 2 3 4 5 6	Best reasons
Green	Worst reasons	1 2 3 4 5 6	Best reasons
Smith	Worst reasons	1 2 3 4 5 6	Best reasons

The problem: A student is walking down the hallway to class. A larger student pushes the student in the back. The student falls to the floor and school books fall all over the floor. We do not know why the other student pushed the student to the floor in the first place. The following stories have students who deal with this problem the same way. But, *the reasons they have for how they deal with the problem are different.*

Directions: First, read all seven stories carefully. Then, read each story again and rate how good or bad the students' reasons are for how they deal with the problem. It does not matter if you agree with how the student deals with the problem. *You are only rating how good or bad the students' reasons are for how they deal with the problem.*

Price is surprised the other student pushed Price to the floor. The other student ignores Price. Teachers tell students it is wrong to push other students during school. Price wants to get the other student back for this. Price is angry and wants to push or kick the other student really hard. Price pushes the other student really hard.

Corey is surprised the other student pushed Corey to the floor. The other student ignores Corey. Students who break the school's rules are punished. Pushing is breaking the school's rules. Students who push other students to the floor should be punished. The other student should be punished for pushing Corey to the floor. Corey pushes the other student really hard.

Wells is surprised the other student pushed Wells to the floor. The other student ignores Wells. Wells thinks about pushing the other student back. Wells' friends told Wells the stories of how they pushed back when students pushed them for no reason. The friends said pushing back worked for them. Wells wants to try that. Wells pushes the other student really hard.

Bower is surprised the other student pushed Bower to the floor. The other student ignores Bower. Bower knows the other student always bullies students in school. Only bad students like to bully other students. Good students do not bully other students in school. This student is a bully. Bower wants to do something about the bully. Bower pushes the other student really hard.

Speer is surprised the other student pushed Speer to the floor. The other student ignores Speer. Speer screams and yells at the other student, and does not care how much bigger the other student is. Speer is very mad and can't calm down. Speer wants to push or kick the other student right away, really hard. Speer pushes the other student really hard.

Jones is surprised the other student pushed Jones to the floor. The other student ignores Jones. Pushing students is breaking the rules and results in punishment. Teachers give immediate punishment that is effective with students who break the school's rules. There are no teachers around to help, so Jones must punish the student effectively. Jones pushes the other student really hard.

Burns is surprised the other student pushed Burns to the floor. The other student ignores Burns. Burns considers what the other student thinks about being pushed. If Burns broke the no-pushing rule, Burns thinks it would violate another student's rights and the other student would want Burns punished. Burns wants the other student punished fairly, but a teacher isn't around. Burns pushes the other student really hard.

Rate how good or bad the students' *reasons* are for how they deal with the problem by circling a number from 1 to 6. Circling "1" means you think the student had the worst reasons. Circling "6" means you think the student had the best reasons. All of the ratings do not need to be used and the same rating can be used for more than one student.

Price	Worst reasons	1 2 3 4 5 6	Best reasons
Corey	Worst reasons	1 2 3 4 5 6	Best reasons
Wells	Worst reasons	1 2 3 4 5 6	Best reasons
Bower	Worst reasons	1 2 3 4 5 6	Best reasons
Speer	Worst reasons	1 2 3 4 5 6	Best reasons
Jones	Worst reasons	1 2 3 4 5 6	Best reasons
Burns	Worst reasons	1 2 3 4 5 6	Best reasons

Please answer the following questions by circling a number on each rating scale.

How much do you like to watch someone calling a person names or teasing them?

Not at all 1 2 3 4 5 6 Very much

How much do you like to watch someone getting physically pushed around?

Not at all 1 2 3 4 5 6 Very much

How often did you push someone around physically?

Never 1 2 3 4 5 6 Many times

How often did you call people names trying to upset them or trying to get people to laugh?

Never 1 2 3 4 5 6 Many times

How often have you been upset because someone pushed, kicked, or hit you for no reason?

Never 1 2 3 4 5 6 Many times

How often have you pushed, kicked, or hit someone first?

Never 1 2 3 4 5 6 Many times

How much were you or are you bullied in school (circle one)?

1) Never
2) 1 day
3) 1–4 weeks
4) 2–12 months
5) 1–2 years
6) 2 years or more

How bad is bullying?

Not bad at all 1 2 3 4 5 6 Totally bad

» APPENDIX B

Student-bully problem (B, 1–2, 2–2)

The problem: A student leaves class to go to the bathroom. When getting back to class, another student is sitting in the student's seat. The student who went to the bathroom was assigned that seat by the teacher and used the seat all year. The following stories have students who deal with this problem the same way. But, *the reasons they have for how they deal with the problem are different.*

Directions: First, read all seven stories carefully. Then, read each story again and rate how good or bad the students' reasons are for how they deal with the problem. It does not matter if you agree with how the student deals with the problem. *You are only rating how good or bad the students' reasons are for how they deal with the problem.*

Mason does not know why the other student took Mason's seat. The other student will not move. Mason wants to get the seat back. Teachers tell students to stay in the seats they were assigned for class. Mason thinks about yelling at the other student, but doesn't yell. Mason doesn't think the other student will listen. Mason tells the teacher what happened.

Lloyd does not know why the other student took Lloyd's seat. The other student will not move. The teacher gives students their own seats. Students who break the rules get punished in school. Students who steal other students' seats break the school rules. If Lloyd pushes the other student roughly, Lloyd will be punished. Lloyd tells the teacher what happened.

Dixon does not know why the other student took Dixon's seat. The other student will not move. Dixon wants to get the seat back. A friend told Dixon how the friend dealt with a student who stole a seat. The friend told on the other student to the teacher. Dixon thinks that could work and wants to try it. Dixon tells the teacher what happened.

Mills does not know why the other student took Mills' seat. The other student will not move. Mills knows that good students do not steal other students' seats. Only bad students take another student's seat without permission from the teacher. This other student must be bad. Teachers should know who the bad students are. Mills tells the teacher what happened.

Baker does not know why the other student took Baker's seat. The other student will not move. Baker screams and yells out loud at the other student to get out of the seat. Baker cannot calm down and threatens to hurt the other student. That is where Baker has sat all year. Baker cannot make the other student move. Baker tells the teacher what happened.

Heath does not know why the other student took Heath's seat. The other student will not move. The other student is breaking the seating rule. Students who break rules get punished by teachers. Heath wants to get the seat back without hurting the other student or breaking rules. The teacher is nearby and can help with this. Heath tells the teacher what happened.

Woods does not know why the other student took Woods' seat. The other student will not move. Woods considers what the other student thinks about the seating rule. If Woods broke the seating rule, Woods thinks it would violate another student's rights and the other student would find it fair if Woods was punished. Woods wants to handle this fairly. Woods tells the teacher what happened.

Rate how good or bad the students' *reasons* are for how they deal with the problem by circling a number from 1 to 6. Circling "1" means you think the student had the worst reasons. Circling "6" means you think the student had the best reasons. All of the ratings do not need to be used and the same rating can be used for more than one student.

Mason	Worst reasons	1 2 3 4 5 6	Best reasons
Lloyd	Worst reasons	1 2 3 4 5 6	Best reasons
Dixon	Worst reasons	1 2 3 4 5 6	Best reasons
Mills	Worst reasons	1 2 3 4 5 6	Best reasons
Baker	Worst reasons	1 2 3 4 5 6	Best reasons
Heath	Worst reasons	1 2 3 4 5 6	Best reasons
Woods	Worst reasons	1 2 3 4 5 6	Best reasons

The problem: A student is walking down the hallway to class. A larger student pushes the student in the back. The student falls to the floor and school books fall all over the floor. We do not know why the other student pushed the student to the floor in the first place. The following stories have students who deal with this problem the same way. But, *the reasons they have for how they deal with the problem are different.*

Directions: First, read all seven stories carefully. Then, read each story again and rate how good or bad the students' reasons are for how they deal with the problem. It does not matter if you agree with how the student deals with the problem. **Y***ou are only rating how good or bad the students' reasons are for how they deal with the problem.*

Ellis does not know the other student who pushed Ellis onto the floor. The other student walks down the hall after pushing Ellis. Pushing someone in a school hallway for no reason is breaking the school rules. Ellis wants to hurt the other student by pushing and kicking the other student. Ellis wants to get the other student back. Ellis pushes the other student really hard.

Clark does not know the other student who pushed Clark onto the floor. The other student walks down the hall after pushing Clark. The school rules say students who push others in school should be punished. Clark knows punishment has been given to students for pushing. Clark thinks the other student should be punished for pushing Clark to the floor. Clark pushes the other student really hard.

Evans does not know the other student who pushed Evans onto the floor. The other student walks down the hall after pushing Evans. Evans' parent told Evans to push other students if they push Evans in school for no reason. Evans wants to do what the parent said. Evans hopes that pushing the other student back will work. Evans pushes the other student really hard.

Flynn does not know the other student who pushed Flynn onto the floor. The other student walks down the hall after pushing Flynn. Flynn knows that good students do not push other students for no reason. Good students try not to break rules or cause trouble in school. Bad students cause trouble in school just like this one is. Flynn pushes the other student really hard.

Davis does not know the other student who pushed Davis onto the floor. The other student walks down the hall after pushing Davis. Davis yells at the other student and threatens to get the other student back. Davis is so angry at the other student and is out of control. Davis wants to hurt the other student right away. Davis pushes the other student really hard.

Allen does not know the other student who pushed Allen onto the floor. The other student walks down the hall after pushing Allen. School rules state that students who push someone should be punished. Adults working in the school should do the punishing. No adults were around to help, but the student should still be punished for pushing. Allen pushes the other student really hard.

Brown does not know the other student who pushed Brown onto the floor. The other student walks down the hall after pushing Brown. Brown considers what the other student thinks about being pushed. If Brown broke the no-pushing rule, Brown thinks it would violate another student's rights and the other student would want Brown punished. Brown wants to be fair, but can't find a teacher. Brown pushes the other student really hard.

Rate how good or bad the students' *reasons* are for how they deal with the problem by circling a number from 1 to 6. Circling "1" means you think the student had the worst reasons. Circling "6" means you think the student had the best reasons. All of the ratings do not need to be used and the same rating can be used for more than one student.

Ellis	Worst reasons	1 2 3 4 5 6	Best reasons
Clark	Worst reasons	1 2 3 4 5 6	Best reasons
Evans	Worst reasons	1 2 3 4 5 6	Best reasons
Flynn	Worst reasons	1 2 3 4 5 6	Best reasons
Davis	Worst reasons	1 2 3 4 5 6	Best reasons
Allen	Worst reasons	1 2 3 4 5 6	Best reasons
Brown	Worst reasons	1 2 3 4 5 6	Best reasons

Please answer the following questions by circling a number on each rating scale.

How much do you like to watch someone calling a person names or teasing them?

Not at all 1 2 3 4 5 6 Very much

How much do you like to watch someone getting physically pushed around?

Not at all 1 2 3 4 5 6 Very much

How often did you push someone around physically?

Never 1 2 3 4 5 6 Many times

How often did you call people names trying to upset them or trying to get people to laugh?

Never 1 2 3 4 5 6 Many times

How often have you been upset because someone pushed, kicked, or hit you for no reason?

Never 1 2 3 4 5 6 Many times

How often have you pushed, kicked, or hit someone first?

Never 1 2 3 4 5 6 Many times

How much were you or are you bullied in school (circle one)?

1) Never
2) 1 day
3) 1–4 weeks
4) 2–12 months
5) 1–2 years
6) 2 years or more

How bad is bullying?

Not bad at all 1 2 3 4 5 6 Totally bad

APPENDIX C

Variable map figures

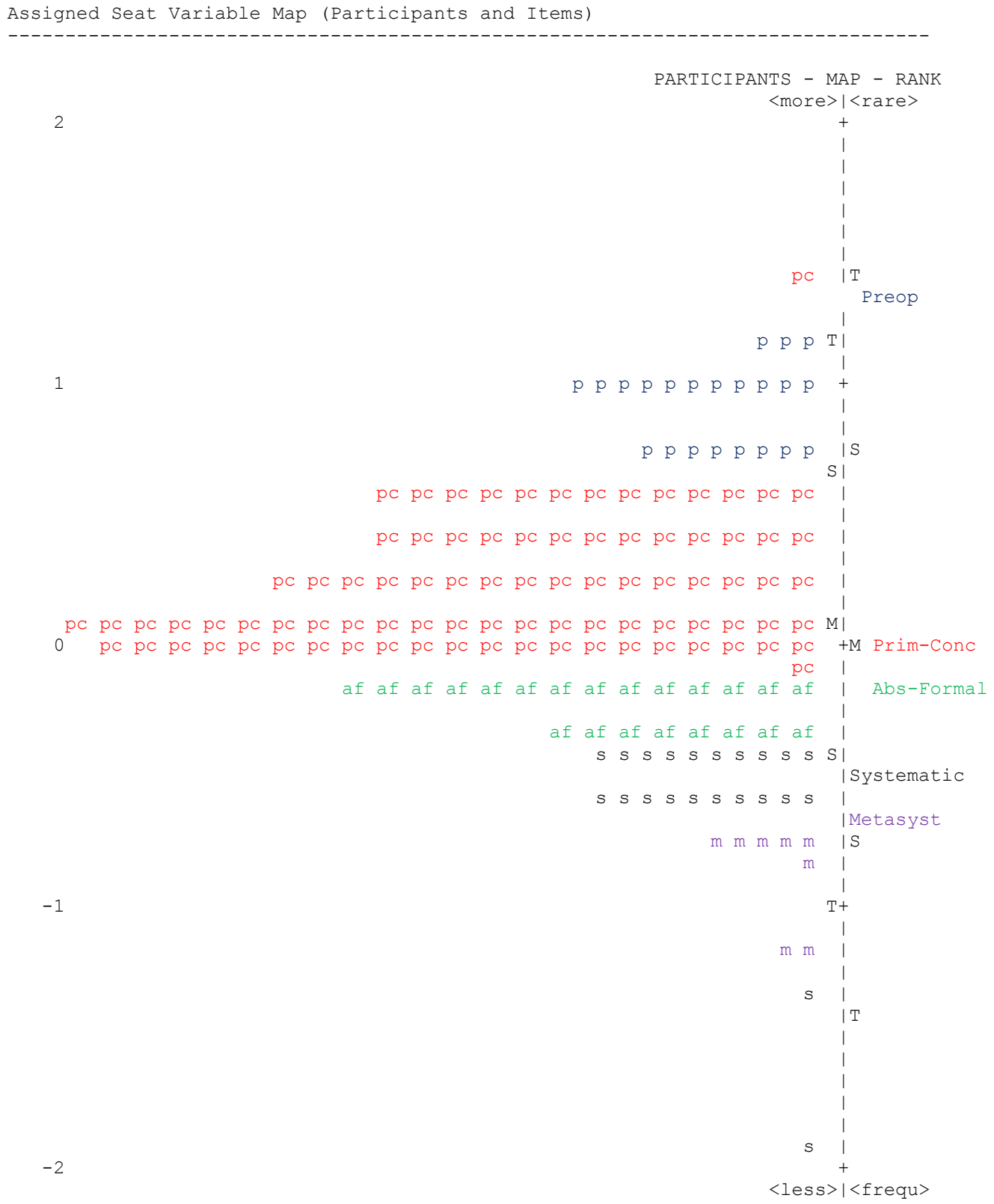


Figure 1. Assigned seat person stage score variable map with multi-stage categories (students)

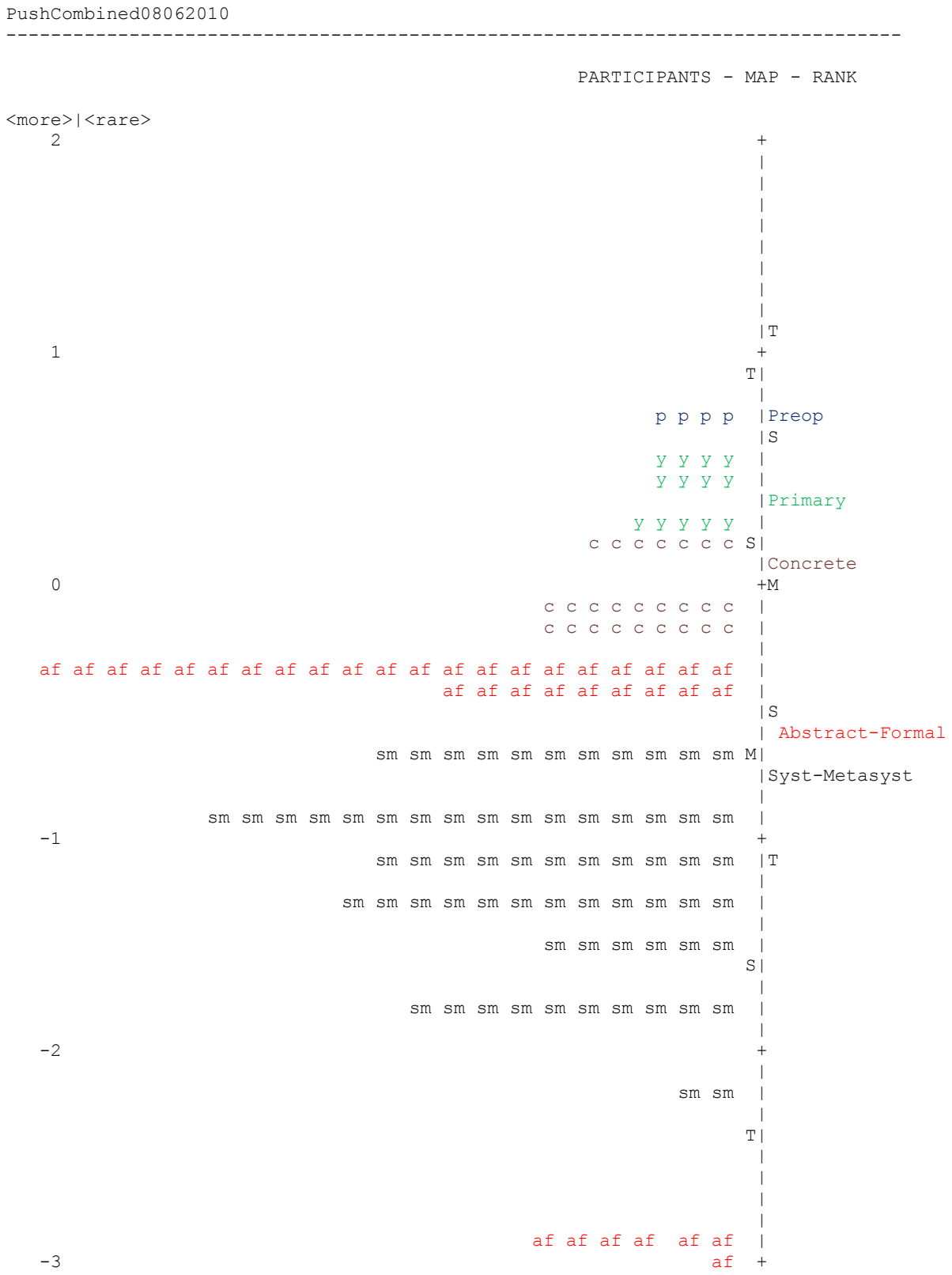


Figure 2. Push person stage score variable map with multi-stage categories (students).

» APPENDIX D

Student-bully problem 2.0 (A) & (B) vignettes

Student-bully problem 2.0 (a) / assigned seat vignettes
03/30/2012 Joaquim

Moore says, "That was my seat in class, and you liked stealing it from me. My friend told me I can get that seat back if I tell the teacher. I will do what my friend said." Moore tells the teacher what happened.

Riley says, "Get out of my seat right now," and screams really loud! "Give me my seat back right away. I am so angry." Riley pushes the other student. The other student does not move. Riley tells the teacher what happened.

Birch says, "Teachers say pushing other students breaks the school's rules. Students who break rules like this may be punished. If some students push other students, then teachers should be the adults to punish them for it." Birch tells the teacher what happened.

Smith says, "What would the other student say and do if I stole a seat? Breaking the seating rule violates another student's rights. The other student would say it was fair if the teacher punished me. I will handle this fairly." Smith tells the teacher what happened.

Green says, "Pushing a student breaks school rules. Rules are made so students do not get hurt at school. Pushing could hurt a student and breaks the rules, so teachers should punish any student who pushes." Green tells the teacher what happened.

Kentssays, "The teacher gave each student one seat for the school year. The teacher told me that is my seat for the school year." Kents pushes the other student, but does not get the other student out of the seat. Kents tells the teacher what happened.

Stowe says, "Sometimes students push other students out of their seats in school. Teachers tell students they should never push or hit other students. Teachers always say that they will help. Students should report problems. Stowe tells the teacher what happened.

Student-bully problem 2.0 (A) / push vignettes

03/30/2012 Joaquim

Bower says, "The other student likes to bully me and students in school. Teachers say students should never be bullying each other in school. Teachers are always telling students to be nice to other students. This student is acting like a bully." Bower pushes the other student really hard.

Jones says, "Pushing students is breaking the rules and results in punishment. Teachers give immediate punishment that is effective with students who break the school rules. There are no teachers around to help with this, so I must punish the student effectively." Jones pushes the other student really hard**.**

Burns says, "I will consider what the other student would do or say after being pushed. If I break the no-pushing rule, it violates the other student's rights, and the other student would punish me. I want the other student punished fairly, but a teacher is not around." Burns pushes the other student really hard.

Speer says, "Get up!" and screams and yells at the other student. "I do not care how much bigger you are than me." Speer is very mad and does not calm down. "I am going to push and kick you really hard right now."Speer pushes the other student really hard.

Corey says, "Sometimes students break the rules in school. Students who break the school rules should be punished. Pushing and hitting is breaking the school rules. If some students act like bullies and push other students, then someone should punish them for it." Corey pushes the other student really hard.

Price says, "The teacher told the class not to push or be rough with each other in school. I am going to get the other student back for doing this. I am angry and will push the other student to the floor." Price pushes the other student really hard**.**

Wells says, "The other student likes pushing me. My friends told me the stories of how they pushed back when students pushed them for no reason. My friends said pushing back worked for them. I am going to do what the friends say will work." Wells pushes the other student really hard.

Student-bully problem 2.0 (B) / assigned Seat

03/30/2012 Joaquim

Dixon says, "The other student liked stealing the seat. A friend told me how the friend dealt with a student who stole a seat. The friend told the teacher what happened. I am going to do what the friend says will work." Dixon tells the teacher what happened.

Baker says, "Get out of my seat!" Baker screams and yells. Baker does not calm down and threatens to hurt the other student. The other student does not move and does not listen to what Baker says. Baker runs to the teacher's desk. Baker tells the teacher what happened.

Lloyd says, "The teacher gave students assigned seats. All students do not follow school rules. The other student broke the seating rule. Pushing the other student breaks school rules too. When students break rules, then teachers should know about it." Lloyd tells the teacher what happened**.**

Woods says, "I will consider what the other student would do or say if I stole a seat. If I break the seating rule, it would violate another student's rights. The other student would find it fair if I was punished. I should handle this fairly." Woods tells the teacher what happened.

Heath says, "The other student is breaking the seating rule. Teachers punish students for rule-breaking. I will get the seat back without hurting the other student or breaking rules. When teachers help with problems, students do not get hurt and rules are not broken." Heath tells the teacher what happened.

Mason says, "I am going to get the seat back. The teacher said to stay in the same seat for the school year. I am going to yell at the other student for this. The other student did not listen last time." Mason tells the teacher what happened.

Mills says, "Teachers have told students not to take other students' seats. Sometimes students do not listen to what teachers say. Teachers ask that students always listen to them. Sometimes, teachers will help out students who lose their seats in school." Mills tells the teacher what happened.

Student-bully problem 2.0 (B) / push

03/30/2012 Joaquim

Flynn says, "Most of the students I see never push other students around. Teachers always tell students not to break the rules or cause trouble in school. Some students will cause trouble in school just like this one." Flynn pushes the other student really hard.

Allen says, "Bullies who push another student should be punished by teachers. When teachers are not around to help, students have to deal with their own problems. When a teacher is not around, a bully still needs punishment." Allen pushes the other student really hard.

Brown says, "I should consider how the other student would react after being pushed. If I push the other student, it violates that student's rights, so the other student would have me punished. I should be fair, but the teacher will not help." Brown pushes the other student really hard.

Davis says, "Get back over here right now! I am going to hurt you!"Davisyells and screams at the other student and is out of control. Davishurtsthe other student right away by pushing and kicking. Davis pushes the other student really hard.

Clark says, "School rules say students cannot push. Different people punish students in school. Sometimes teachers punish students. Teachers do not always see what happens. When teachers do not see what happens, then someone should punish students for pushing." Clark pushes the other student really hard.

Ellis says, "The teacher told us that pushing in the hallway is breaking the school rules. I am going to get the other student back for this. I will hit or push the other student." Ellis walks after the other student. Ellis pushes the other student really hard.

Evans says, "The other student liked pushing me down. The last time a student pushed me in school, my parent said to push the other student back. I want to do what my parent told me to do." Evans pushes the other student really hard.

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Stars that crash

Michael Lamport Commons[1], Lucas Alexander Haley Commons-Miller[2], Rnad Jihad Salaita[3], and Charu Tara Tuladhar[2]

1 Harvard Medical School
2 Dare Institute
3 Mount Holyoke College

ABSTRACT

The present study introduces a model explaining what leads stars to crash and assesses risk factors that lead stars to crash in a sample of 18 celebrities who have had a downfall. Downfalls include alcoholism, drug abuse or addiction, mental illness, myriad relationship problems, death, suicide or other life-changing disasters. First, the paper theorizes that individuals' early environments and social forces, such as assortativeness and affiliation, contribute to their narcissistic traits. The model illustrates how these risk factors including narcissistic traits and the adult environments of stars lead them to engage in behaviors that lead to their downfalls. To examine the usefulness of this model, the paper examined the lives of famous celebrities (i.e., "stars") who had public downfalls (n = 18) using secondary sources. It assessed the risk factors involved in the crashing of stars. In concordance with the proposed model, results showed that what the majority of these cases had in common were: Atypical early environments, such as abandonment and trauma, over-indulgent or absent wealthy parents, or an early career; and adult environment conditions, such as colluding social groups and entourages. These factors could be linked to stars having extramarital affairs damaging their marriage or careers; bankruptcy; or alcohol and/or drug addiction. In some cases these factors have led to stars having accidents, or deaths. Furthermore, the study shows that there is a positive correlation between the number of risk factors present and the severity of the downfall of the stars.

KEYWORDS: narcissism, stars, drug abuse, celebrity, childhood, alcohol abuse, wealthy parents, entourage, social environment

Individuals who acquire fame in the public eye, sometimes, end up crashing. Crashing can include alcoholism, drug abuse, addiction, mental illness, myriad relationship problems, death, suicide or other life-changing disasters. For the purpose of this study, *stars* are individuals who receive a lot of media attention, and have become extremely wealthy due to their successful careers or performances. According to the Merriam-Webster dictionary ("Star," 2013), a "Star is: a) highly publicized theatrical or motion-picture performer b); an outstandingly talented performer; or c) a person who is preeminent in a particular field." Stars are public figures, idolized in media sources for their extreme wealth or professional success ("Celebrity," 2013). Stardom occurs most commonly in professionals such as actors, musicians, athletes, or politicians, to name a few ("Celebrity," 2013; "The hot new celeb? Sarah!" 2008). The first section of this paper assesses contributing factors and risk factors that can lead stars to crash and proposes a model explaining their relationship. In the model, we establish that early environments and social forces such as assortativeness and affiliativeness (Koestner& McClelland, 1992) contribute to personality problems and narcissistic behaviors in "stars". Assortativeness refers to the tendency of humans to mate with others of similar physical and personality characteristics (Thiessen, Young, & Delgado, 1997). More generally, assortativeness is showing a preference for membership in a group whose members share a large number of characteristics. Affiliativeness refers to a nonconscious need to have close, friendly relationships with others (Koestner & McClelland, 1992). More generally, affiliativeness is showing a preference for including a wide range of people in one's social, organizational, political and military life. These traits can lead to maladaptive behaviors that may lead to failure in professional life, loss of income, and sometimes even loss of life. In the second section, we apply the model to the lives of actual stars who had public downfalls and examine whether some of the background factors and the maladaptive behaviors they engaged in fit the model. The lives of stars were assessed analyzing information from secondary sources.

Correspondence concerning this paper should be addressed to Michael Lamport Commons, Department of Psychiatry, Harvard Medical School, 234 Huron Avenue, Cambridge, Massachusetts, 02138. Email: commons@tiac.net

Importance of this study

One question that arises is: Is it worthwhile to investigate the downfall of a few rich and famous individuals? We assert that it is important. Beyond the value inherent in each of these individual's own lives, these stars are central figures in producing, popularizing and re-enforcing important cultural values. Studies show that celebrities can influence peoples beliefs in areas such as political opinions (Veer, Becirovic, & Martin, 2010), consumption behaviors (Dix, Phau, & Pougnet, 2010), and health (Brown, Basil, & Bocarnea, 2003). They are role models to many individuals, especially the young adolescents of today. Giles and Maltby (2004) found that adolescents' "high emotional autonomy was a significant predictor of celebrity interest". They also found that high interest in celebrities was related to "low levels of security and closeness". Distefan, Pierce and Gilpin (2004) found that when non-smoking adolescents' favored stars that smoked on-screen, it predicted their risk of smoking later on. We propose that investigating why these influential figures engage in maladaptive behaviors will not only help in finding out ways to help these people, but may also indirectly help the general public who are influenced by them.

In light of claims in Giles & Maltby, (2004), that adolescents are highly influenced by celebrities, the present study seeks to raise awareness about the psychological factors involved in these stars' lives. This could provide guidance for fans, parents, and the general public. For example, the model could guide adolescents in their celebrity fandom experiences. As adolescents pursue information on their preferred celebrities, it is necessary to examine multiple dimensions of a star's life prior to deciding which stars are suitable role-models.

» FACTORS INVOLVED IN WHY STARS CRASH

In this section, we consult existing literature to assess the relationship between narcissistic personality traits and other personality problems related to stardom. We also discuss the role of early childhood experiences, such as abandonment and trauma, and social factors, such as assortativeness and affiliativeness. Then we discuss maladaptive behaviors associated with narcissistic traits. Finally, based on this literature review, we propose a theoretical model showing how stars crash.

Narcissistic tendencies among stars

There are a few studies that link narcissistic traits to stardom and seeking of stardom (e.g. Celedonia & Williams, 2006; Greenwood, Long, & Dal Cin, 2013; Young & Pinsky, 2006). Wrzos (1987) defined narcissism as "self-directed ego activity which generates affects that function to sustain the self-representation and regulate self-esteem." Most of the existing research on narcissism in stars has been with individuals who are post stardom. Young and Pinsky (2006) showed that celebrities tended to be more narcissistic than students pursuing a master's degree in Business Administration (MBA) and the larger population. However, this study found that narcissism scores did not vary with years of experience. Their findings suggest that narcissism existed prior to the entry of the stars into the industry, or that narcissism appeared early on in their career. Celedonia and Williams' (2006) study on the desire for fame and its relationship to personality suggested that the desire for fame and narcissism were significantly related in their sample. A study on the appeal of fame in relationship to other factors including narcissism (Greenwood et al., 2013) found an association between narcissism and the "appeal of visibility and status," as well as a "perceived realism of future fame." From these studies, we infer and establish that narcissistic traits and stardom are associated, although which comes first is not clear from this literature.

Factors that may contribute to narcissism

Early environment of stars: Possible abandonment, trauma and overindulgent or absent wealthy parents. Early experiences of childhood abandonment and trauma, including parental death and divorce have been associated with personality problems, including narcissistic traits (Beatson, 1995; Brennan & Shaver, 1998; Mandelbaum, 1980; Marmar & Freeman, 1988; Mishne, 1979). Individuals with narcissistic disorders have shown to be characterized by their experience of severe emotional trauma and/or deprivation and neglect in infancy or early childhood. Childhood sexual or physical abuse, domestic violence, parental character pathology and intergenerational transmission of attachment patterns have been found as some of the etiological factors (Beatson, 1995; Hibbard, 1993).

Parental divorce during childhood has also been shown to be one of the contributors of narcissistic personality. Brennan and Shaver (1998) found that college students who experienced parental divorce in their childhood scored higher on narcissism scale than did those who did not experience parental divorce.

Research shows that having overindulgent, wealthy and famous parents may also be related to narcissism (Capron, 2004; Grinker, 1978). Capron (2004) found that individuals having parents who pampered them by being overindulgent was associated with overall narcissism and contributed to their sense of entitlement and exhibitionism. Grinker (1978) suggested that the little parental contact with children of wealthy parents leads to "shallow values and pathological narcissism." Based on this finding, one can infer that stars who grow up in families with famous, wealthy, overindulgent parents may not experience an optimal childhood experience.

As these pieces of evidence suggest that early life experiences are associated with narcissism, it is predicted that narcissistic stars may have had such early life experiences as well.

Social forces related to narcissism in stars. Two social forces of interest are *assortativeness* and *affiliativeness*.

Assortativeness refers to the tendency of humans to mate with others of similar physical and personality characteristics (Thiessen, Young, & Delgado, 1997). Assortativeness is also showing a preference for membership in a group whose members share a large number of characteristics. Bon et al. (2013) showed that their participants, including those who had extreme personality traits (scored very high on Cloninger's Temperament and Character Inventory (TCI)), preferred positive assortative mating (similarities) over complementarity (preferring to compensate for variations). Extending this concept of assortative mating to social relationships, we assume that stars also engage in positive assortative social relationships.

This assortative force may lead narcissistic stars to socialize with other narcissistic individuals. Freeman and Fox (2013) pointed out that narcissistic individuals are often raised in families where the available role models value important, powerful, and credible others. Thus, their narcissistic style and behavior are reinforced. From this we may infer that when narcissistic stars befriend other narcissistic individuals, they may create assortative friendships or relationships (e.g. relationships based asserting power and importance over others). Those narcissistic individuals reinforce the narcissistic characteristics in stars.

Assortative behavior may appear in the form of codependence such as stars engaging in maladaptive behaviors like drug abuse along with their friends or partners. Drug codependency can be considered a "self-centered and self-referential behavior", and it may be indicative of the users' need to receive attention from each other (Ronningstam & Gunderson, 1990). These two behaviors are characteristic of narcissists. Therefore, assortative friendships or relationships, such as codependency, are assumed to have an influence on narcissistic traits. Thus, it is predicted that assortative relationships lead narcissistic stars to socialize with other narcissistic individuals, who in turn, promote the stars' narcissistic behaviors.

Affiliativeness is another social force that can be related to narcissism. Affiliativeness refers to the implicit affiliation motive (need for affiliation), which is defined as a nonconscious need to have close, friendly relationships with others (Koestner & McClelland, 1992). Studies have indicated that narcissism is related to affiliation (Ronningstam & Gunderson, 1990; Tanchotsrinon, Maneesri & Campbell, 2007) and affiliation is also associated with an increased appeal of fame (Greenwood et al., 2013). Individuals show a higher need for affiliation when they are faced with non-positive social stimuli (Kordik, Eska & Schultheiss, 2012). Individuals seeking stardom would face a lot of rejection. Hence, they may also seek more affiliation by showing a greater tendency to seek positive expressions from their social group. Stars tend to go as far as spending a lot of money on people in their social circle to be supported and accepted. This behavior of seeking positive expressions from others has been linked to narcissistic traits. A study by Tanchotsrinon et al. (2007) revealed that participants who were higher on narcissism showed more attraction to people who offered them "the potential for self-enhancement." The need to receive admiration and reinforcement is a characteristic of narcissism (Ronningstam & Gunderson, 1990). Greenwood et al. (2013) showed that affiliation or 'need to belong' was associated with an increased appeal of fame. Thus, it can be inferred that unlike a common person's need to belong, stars are expected to seek social approval from a much wider group of individuals, including strangers (fans, and everyone in the public). Seeking appreciation and fame from strangers in turn may influence narcissistic tendencies of the stars.

Adult environment of stars contributing to their narcissistic traits. Stars often have claques. Traditionally, a claque was an organized body of professional applauders in French theatres and opera houses. Members of a claque are called claqueurs. Here, a claque includes managers, fans and a larger entourage who contribute to narcissistic traits of the stars. They may submit to the stars' demands or even to demands that they only infer. It is speculated that friends and assistants who submit to their demands may also contribute to their narcissistic traits. Having people in the claque who submit to unreasonable demands can feed an individuals' ego which reinforces that individual's narcissistic traits. Tiebout (1994) shows that addicts in recovery must first surrender their "inflated ego" in order to recover. This indicates that the inflated ego (a characteristic of narcissism) is connected to addiction. It also allows one to infer that reinforcing the addictive behaviors will reinforce the ego, and vice versa. One can infer that satisfying maladaptive behaviors may reinforce the narcissists' underlying issues, such as their need for admiration and sense of entitlement. Therefore, such individuals in a star's social circle may play a role in reinforcing narcissism in the star. Many members of claques often have borderline personality tendencies. These may be illustrated by their enmeshment with the stars. An example of this enmeshment that led to a bad outcome may be seen in the case of Selena Quintanilla-Pérez. She was murdered by Yolanda Saldívar, a Selena Etc. clothing boutique manager, who had been her fan-club president until she was fired for embezzlement three weeks earlier ("New Album from Selena Quintanilla 17 Years After Her Death," 2012). Yolanda was in Selena's claque and had borderline tendencies, such as, claiming to love Selena like a daughter and being obsessed, but ended up murdering her.

Research also shows that narcissists tend to stay close to friends who are non-threatening (Nicholls & Stukas, 2011).This may be another way in which stars maintain their narcissism, another type of remaining close to individuals who satisfy their ego. Nicholls and Stukas (2011) found that participants who were higher on narcissism decreased their closeness to their friends when faced with a threat from that person.

Effects of being a narcissistic star

Narcissism has been linked to a number of maladaptive behaviors. Previous research indicates that narcissism is related to making bad investments and losing money. Lakey, Rose and Campbell (2008) showed that narcissism is related to "gambling-related pathology." Foster, Reidy, Misra and Goff (2011) found that narcissists, in their study, made riskier stock market investments and lost more money. Furthermore, many star athletes emerge from difficult backgrounds and rise to great stardom and wealth, but are incapable of managing this new lifestyle or money (Manfred, 2013). From these studies, it can be inferred that narcissistic stars are inclined to making investments or expenditure that lead to substantial financial loss.

Narcissism has also been linked to problems in one's interpersonal relationships. Roche et al. (2012) found that pathological narcissism (grandiosity and vulnerability) was "reflective of interpersonal dysfunction." One might expect to see problematic attachments in narcissistic individuals' interpersonal relationships, close friendships, or marriages. It is predicted that many narcissistic stars tend to have failed relationships as well.

Narcissism has also been shown to predict alcohol and drug abuse. Narcissism has been shown to predict alcohol use in college-aged students (Luhtanen & Crocker, 2005). Likewise,

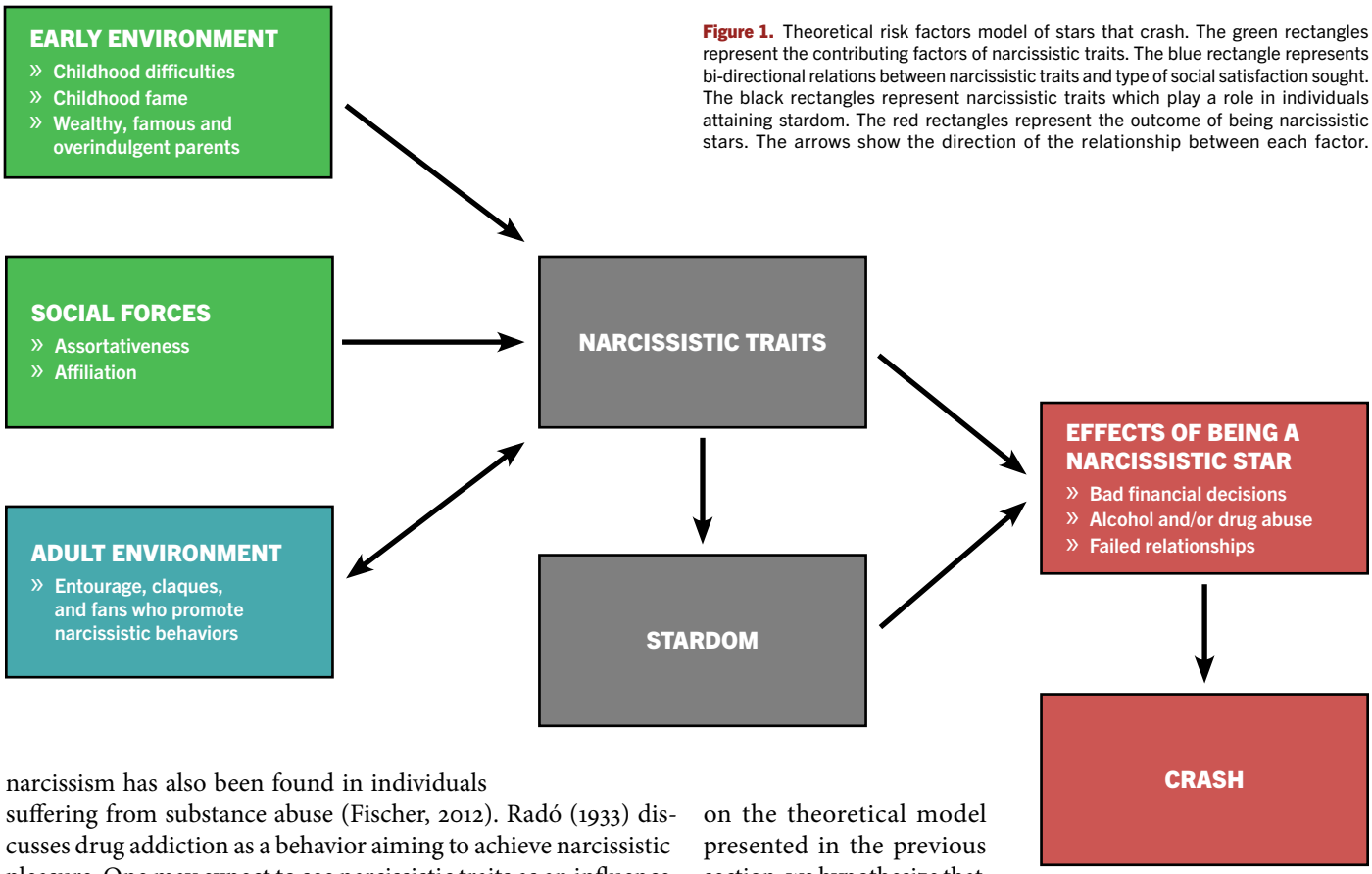


Figure 1. Theoretical risk factors model of stars that crash. The green rectangles represent the contributing factors of narcissistic traits. The blue rectangle represents bi-directional relations between narcissistic traits and type of social satisfaction sought. The black rectangles represent narcissistic traits which play a role in individuals attaining stardom. The red rectangles represent the outcome of being narcissistic stars. The arrows show the direction of the relationship between each factor.

narcissism has also been found in individuals suffering from substance abuse (Fischer, 2012). Radó (1933) discusses drug addiction as a behavior aiming to achieve narcissistic pleasure. One may expect to see narcissistic traits as an influence on the stars' use of substances.

Stars, who are narcissistic, are also vulnerable to alcohol and drug abuse. Schaller (1997) showed that an increase in fame was associated with higher alcohol use. It is also common to see stars in therapy or drug rehabilitation centers ("Celebrities in rehab: Stars who battled addiction and more," 2013).Thus, alcohol and drug abuse may be common outcomes of being a narcissistic star.

The model

The proposed model in Figure 1 is a risk factor model that summarizes what leads stars to crash. According to the proposed model, early childhood environment (childhood trauma, abandonment, poverty or wealth) and social forces (assortativeness and affiliativeness) are risk factors that contribute to narcissistic traits in stars. Another risk factor is having entourages and claques who help maintain narcissistic traits. As a result of narcissism and stardom, stars engage in maladaptive behaviors such as bad financial decisions, alcohol and drug abuse, and relationship problems. These maladaptive behaviors in turn become risk factors for a crash. The greater the number of risk factors, the more likely it is for the stars to crash. Outcomes of crashing may include death, bankruptcy, addiction and substantial damage to career or relationships with significant others.

» THE STUDY

The current study assesses cases of stars who have crashed. Using a variety of archival sources, it examined their early childhood experiences, social forces, social circle and maladaptive behaviors. Based on the theoretical model presented in the previous section, we hypothesize that:

1. Stars who have crashed have had early childhood experiences of trauma, abandonment, poverty or extreme wealth.
2. Stars who have crashed engaged in assortative relationships and affiliative behaviors.
3. Stars who have crashed had entourages who supported their narcissistic characteristics.
4. Stars who have crashed have engaged in maladaptive behaviors such as making bad financial decisions, alcohol or drug abuse and relationship problems.
5. The number of risk factors present and the severity of downfall are positively correlated.

» METHOD

Participants

A convenience sample of 18 cases of famous and wealthy individuals, who either lost their status as stars or their lives, was examined. The individuals came from a range of professions that vary from politics to sports to the entertainment business. Specifically, there were 3 politicians, 7 actors or actresses, 3 rock musicians, 1 jazz musician, 1 comedian, 1 rapper, and 2 athletes. Based on the model, all the 18 cases are assumed to have narcissistic traits.

Procedure

Online sources, articles, and interviews about the personal lives of 18 celebrities who succeeded and eventually fell in the public eye were collected. They were coded for common categories

across the stories using a deductive approach. This method began with the hypothesized categories, and then set out to validate or verify the categories as they appeared across the available sources. We altered the codes throughout the process by combining similar codes into larger categories. For example, childhood abuse, childhood poverty and childhood abandonment were categorized under childhood difficulties. The final codes generated were childhood difficulties, childhood wealth or fame, adult environment, drugs or alcohol abuse, bad financial decisions, and relationship problems. After creating the list of codes, the case biographies were re-examined for directional connections between the categories. The childhood difficulties category included the following conditions: abusive caregivers, abandonment, financial hardships, parental divorce, death or absence of a parent, alcoholic parent(s), imprisoned parent(s), and moving around, for example: being raised in foster homes. Childhood wealth or fame was categorized by having wealthy parents or an early career. The adult environment category included: others who were seeking financial benefits from the star, friends or family who supplied drugs, and drug codependency. The social forces category included: overspending on others (affiliation), codependency (assortativeness), and trying to impress others. Drug or alcohol abuse reported whether they used drugs or alcohol. Bad financial decisions included those who were reported overspending money on others or making investments that led to substantial financial loss. Relationship problems included having had one or more divorces, the failure of a serious relationship, spousal abuse, extramarital affairs, and one report of a murdered girlfriend. Narcissism in the stars was not assessed because it was not possible due to the nature of subjects analyzed in this study.

» RESULTS

The following analyses were performed. First, prevalence of each factor in the cases analyzed will be reported. Then the kind of downfalls will be presented. Finally, the correlation analysis of the number of factors present and severity of the outcome (downfall) will be reported. It is assumed that the stars examined had some narcissistic tendencies.

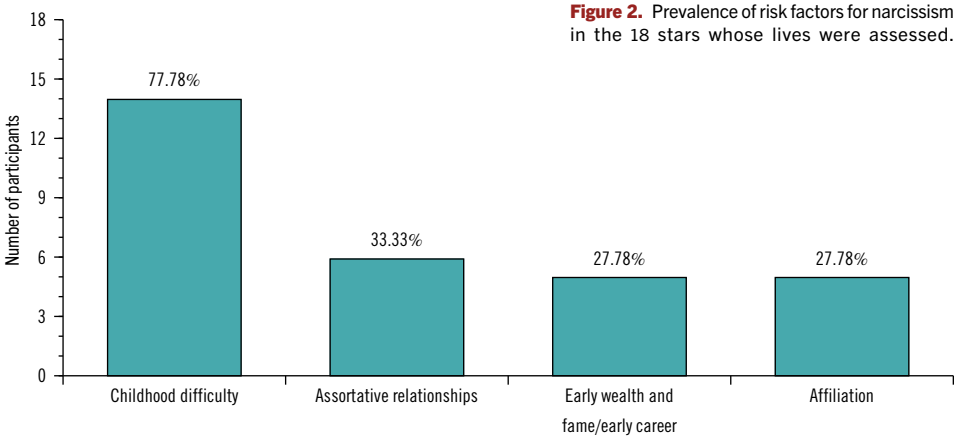


Figure 2. Prevalence of risk factors for narcissism in the 18 stars whose lives were assessed.

Prevalence of factors

All 18 stars whose lives were assessed, either had childhood difficulty (77.78%) or childhood wealth and fame or early career (27.78%). Approximately, 33.33% of these individuals engaged in assortative relationships or affiliation and 27.78% had entourages or people in their social circle, who supported their narcissistic characteristics reinforcing their narcissism. This is represented in a bar diagram in Figure 2. Figure 3 shows that a majority (55.56%) of the stars had two of the three outcomes of being a narcissistic star, 5.56% had all three, 22.23% had one and 5.56% had none. Majority of them (88.89%) had failed relationships, 11.11% made bad financial decisions and 61.11% of the stars abused alcohol and/or drugs. Table 1 details the presence and absence of each variable for each star whose cases were analyzed in this study. Given that this group of stars does show significant percentages of people that exhibit the factors that are discussed, each factor will now be discussed in more detail below.

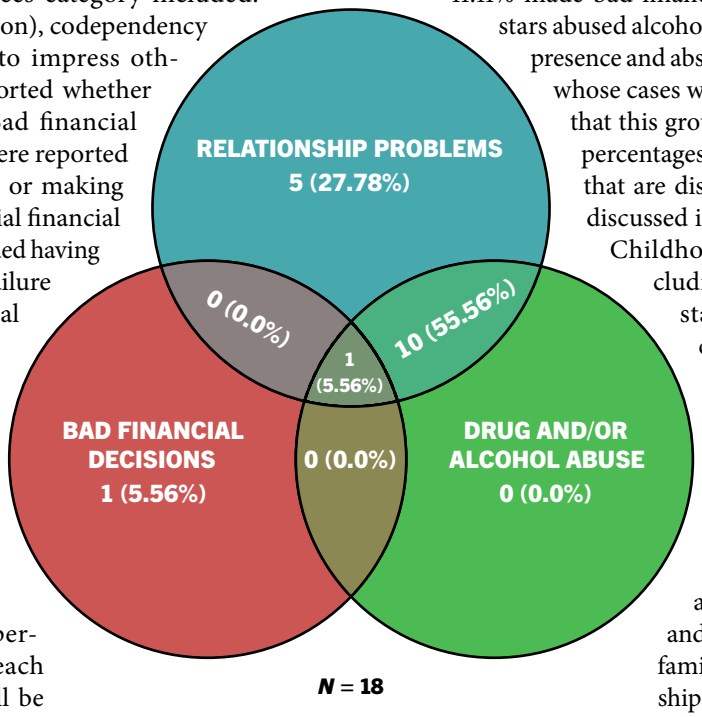


Figure 3. Venn diagram showing prevalence of overlaps between the three outcomes of being narcissistic stars among the 18 stars whose lives were examined. The blue circle represents the set of stars who had relationship problems. The orange circle represents the set of stars who made bad financial decisions and the green circle represents the set of stars who abuse drugs and/or alcohol. 10 stars had both relationship problems and abused drugs and/or alcohol and 16 stars had relationship problems. One of the stars did not have either of the problems.

Childhood difficulties or traumas, including abuse, affected 14 of the 18 stars (or 77.78%). To show how childhood difficulties may have affected the lives of the stars, we will share some examples detailing the type of difficulties they experienced. Lindsay Lohan, for example, struggled with an alcoholic father ("Lindsay Lohan Biography," 2013), who also went to prison for assault and other charges; Richard Nixon's family struggled with financial hardships ("Biography of Richard Milhous Nixon," 2013); Elvis Presley grew up in poverty (Anderson, 1978); Marilyn Monroe was abused, and was moved around to different foster homes ("Marilyn Monroe Biography," 2013); James Dean's mother died when he was nine years old ("James

Table 1. Historical or concomitant conditions (risk factors) associated with downfall (input)

Name	Profession	Difficult childhood	Childhood wealth/fame	Adult environment	Social forces	Drugs/ alcohol	Bad financial decisions	Relationship problems
Bill Clintoni	Politician	Abusive stepfather	No	Not enough info		No	Not enough info	Affair
Charlie Parkerii	Jazz musician	Abandoned by father	No	Not enough info		Yes	Not enough info	3 divorces
Charlie Sheeniii	Actor	No	Parents were wealthy actors Early career	Others seeking financial benefits	Spending a lot of money on people in his social circle (affiliation)	Yes	Overspending on entourage	3 divorces
Elvis Presleyiv	Rock musician	Grew up poor	No	Entourage/fans. Also had people seeking financial benefits.	Spending a lot of money on people in his social circle (affiliation)	Yes	Not enough info	1 divorce
Heath Ledgerv	Actor	Parents divorced when he was 11 years old	No	Not enough info		Yes	Not enough info	Serious relationship ended
James Deanvi	Actor	Mother died (9 years old)	No		Trying to impress a girl (affiliation)	No	Not enough info	Never married
John Edwardsvii	Politician	Financial hardships	No	Not enough info		No	Not enough info	Affair
Judy Garlandviii	Actress	No	Early career Professional parents	Not enough info		Yes	Not enough info	4 divorces
Kurt Cobainix	Rock musician	Parents divorced when he was 9	No	Not enough info	Drug codependency - assortativeness	Yes	Not enough info	Abuse/drugs
Lenny Brucex	Comedian	Parents Divorced (5 years old)	No	Not enough info		Yes	Not enough info	Divorce
Lindsay Lohanxi	Actress/singer	Alcoholic father Father went to prison	Early career Wealthy parents	Not enough info		Yes	Not enough info	Never married
Magic Johnsonxii	Athlete	financial hardships teased by neighborhood kids	No	Not enough info		No	Not enough info	Affair (indicated by his AIDs)
Marilyn Monroexiii	Actress	Fatherless; moved around foster homes and orphanages	No	Not enough info		Yes	Not enough info	3 divorces
MC Hammerxiv	Rapper	Father was a gambler Financial Problems	No	Others seeking financial benefits	Spending a lot of money on people in his social circle (affiliation)	No	Overspending on entourage	None
Richard Nixonxv	Politician	Financial hardships	No	Not enough info		No	Not enough info	None
Rick Nelsonxvi	Actor	No	Early career Parents were wealthy actors	Manager supplied him with cocaine		Yes	Not enough info	Divorce
Sid Viciousxvii	Rock musician	Absent father Death of stepfather	No	Mother supplied drugs	Drugs codependency with girlfriend and manager (assortativeness)	Yes	Not enough info	Girlfriend was murdered
Tiger Woodsxviii	Athlete	No	Early career	Not enough info		No	Not enough info	Affair

Dean Biography," 2013b); Charlie Parker's father abandoned his family when he was young ("Charlie Parker Biography," 2013); Heath Ledger experienced parental divorce when he was 11 years old ("Heath Ledger Biography," 2013); and Bill Clinton had an alcoholic stepfather who abused his mother and half-brother ("Bill Clinton Biography," 2013a).

Childhood wealth and/or an early career were prevalent in 5 out of the 18 cases. Charlie Sheen had famous, wealthy parents and a successful career that then ended with addiction and drug abuse. He began his acting career at the age of nine ("Charlie Sheen Biography," 2013). Rick Nelson also had famous parents, as he began his career by joining his parents' show and following in their footsteps ("Rick Nelson Biography," 2013). Lindsay Lohan's parents were former actors who helped launch her career at a very young age ("Lindsay Lohan Biography," 2013).Judy Garland also began her acting career at a young age, with her first movie contract at the age of 13 ("Judy Garland Biography," 2013). The fame and career of the stars' parents, and/or the early beginning to their own career means that they had atypical childhoods. Stars like Tiger Woods may have had a childhood without abuse or traumas, but he did not have a regular childhood. Tiger Woods underwent intensive training at a young age, and devoted his time to developing his athletic skills. He participated in tournaments at the young age of eight ("Tiger Woods Biography," 2013b). He also prioritized his career over his education by leaving Princeton University after two years ("Tiger Woods," 2013).

Social forces such as affiliation and assortative relationships were prevalent in six out of the 18 stars who were studied. Behaviors such as trying to impress specific people, the general public and spending a lot of money on others were coded as engagement in affiliation. Drug codependency was coded as presence of assortative relationship. Four of the cases showed a need for affiliation and two cases showed an assortative need. Elvis Presley and Rick Nelson sought social approval and thus engaged in affiliation. The analysis revealed that Elvis Presley's entourage influenced his overspending behavior as he spent a lot of money on his friends and associates (Anderson, 1978). Elvis Presley sought social approval from his fans throughout his career as he worked to appear in films ("Elvis Presley Biography," 2013). Rick Nelson started his first label after having told a girl that he was going to do that, so he started the label in order to seek social approval and prove that he could do it ("Ricky Nelson," 2013).Courtney Love and Kurt Cobain on the other hand used drugs together ("Kurt Cobain Biography," 2013) showing codependency and thus engaging in an assortative relationship.

Slightly under 1/3 (5 of the 18) stars who were studied had individuals in their adult environment who reinforced their narcissistic characteristics. Three of the cases (Charlie Sheen, Elvis Presley and M. C. Hammer) examined had people in their entourage or friends who were seeking financial benefits, and two (Rick Nelson and Sid Vicious) had "friends" or family members supplying them with drugs or using drugs with them.

The stars' marital problems appeared to be a theme across almost all of the cases. A few of the stars examined had supportive families and close relationships, and many had children, but were unable to remain committed due to addictions (e.g. Rick Nelson) or infidelity (e.g. Tiger Woods). Seven of the eighteen cases (e.g. Charlie Sheen) had failed marriages that ended with one or more divorces. In one case (Heath Ledger), a serious relationship failed. Four of these stars had three or more divorces. Others either remained in marriages after having affairs (e.g. Bill Clinton) or abusing the spouse or never married (e.g. Lindsay Lohan). Two of the cases had happy marriages (e.g. M. C. Hammer) with no reports of marital problems. The results show that the narcissism that some stars experience had an effect on their personal relationships and made them less capable of having successful marriages and commitments.

The study also found some of the stars who were studied, such as M. C. Hammer and Elvis Presley, made bad financial decisions, especially through reckless spending on their entourage. They loved to spend money on their "friends" and staff, but the outcome proved to be unaffordable for M. C. Hammer as it led to his bankruptcy (Brockes, 2013; "M. C. Hammer Biography," 2013; "Elvis Presley Biography," 2013). The need to overspend is problematic due to the social factors involved (needing to behave this way in order to receive acceptance and self-verification).

Eleven out of the eighteen stars had drug or alcohol problems. In the case of Lindsay Lohan, alcohol was also a factor in the "childhood difficulties" (alcoholic parent) category. Eight of the cases had drug-related deaths (e.g. Judy Garland). Rick Nelson died in a plane crash, but had traces of cocaine and marijuana in his blood ("Rick Nelson Biography," 2013). Charlie Sheen and Lindsay Lohan struggle with alcoholism ("Charlie Sheen Biography," 2013). Drugs and alcohol appear as an immediate threat to the stars, leading to the actual "crash" through a fatal overdose, or indirectly affecting the decisions of the stars (such as Rick Nelson). Table 2 shows the types of downfalls that the stars experienced.

Outcomes/downfall

Seven categories of intermediate or final downfalls emerged. They were political lies, extramarital affairs, bankruptcy, problems due to drugs and alcohol addiction, accidental death due to poor judgment, drug related deaths and suicide. Table 2 lists the stars who fell under each of these categories.

Table 2 shows that 10 of the 18 stars died. Kurt Cobain committed suicide ("Kurt Cobain Biography," 2013), whereas James Dean died in a fatal car accident due to speeding in a racing car ("James Dean Biography," 2013) and Rick Nelson died in a plane crash as he was flying on a 41 year old private plane that had had mechanical problems before ("Ricky Nelson," 2013).The rest of the stars who died, had drug related deaths.

Among the stars who did not die, their intermediate downfalls (drug and/or alcohol addiction, political lies, bankruptcy and extramarital affairs) had varied levels of impact on their careers. Tiger Woods' extra marital affairs with multiple partners not only led to a divorce with his wife, but also led to loss of many endorsements, a break in his golf career and a drop in his rankings from number 1 to as low as 58 ("Tiger to Suffer," 2009; "Elin Nordegren on Tiger Woods," 2010; "Tiger Woods Is Back, 2013). Bill Clinton was impeached by the House of Representatives for a perjury and obstruction of justice for lying about having a sexual relationship with Monica Lewinsky under oath ("Impeachment: The Overview,"

Table 2. Types of downfall (outcomes) experienced by the stars

Drugs and alcohol	Accidental death due to poor judgment	Drug-related deaths	Suicide	Political lies	Bankruptcy	Extramarital affairs
Charlie Sheen Lindsay Lohan	James Dean (car crash) Rick Nelson (plane crash)	Judy Garland Marilyn Monroe Elvis Presley Charlie Parker Heath Ledger Sid Vicious Lenny Bruce	Kurt Cobain (+drugs)	Richard Nixon John Edwards	MC Hammer	Bill Clinton Tiger Woods Magic Johnson John Edwards

1998). Although he was acquitted and continued his term in the office, he was only the second President in the history of the United States to be impeached ("The Senate Acquits," 1999). Magic Johnson was infected with HIV due to having sexual intercourse with multiple partners and not taking proper precautions ("Magic Johnson Biography," 2013). It cost him his career in basketball as he retired after finding out about having the virus. John Edwards was accused of using his campaign money to hide his affair and his illegitimate child ("John Edward Pleads," 2011). His political career came to a halt following his sex scandal and the following trials ("Another Comeback Kid?" 2013). M. C. Hammer declared bankruptcy six years after the success of his album *Hammer* ("M. C. Hammer Biography," 2013). Although he continued with his career, he was not able to regain the kind of success he had in his initial years. Charlie Sheen's personality including drug and alcohol abuse led to a conflict with the creator of the series, *Two and a Half Men* ("Charlie Sheen Biography," 2013). This cost him is lead role in the series. He was banned from the production lot and the remaining four seasons of the show were canceled. Lindsey Lohan was arrested for driving under influence and sent to drug rehabilitation several times in the course of six years ("Lindsey Lohan Talks." 2013). The report states that her career began to dwindle following her arrests in 2007. Richard Nixon was the only US president to resign from his presidency as his administration tried to cover up its involvement in breaking in at the Democratic National Committee headquarters at the Watergate office complex in Washington D. C. ("Richard M. Nixon," 2013).

Correlation between severity of downfall and number of factors present

The types of downfalls, intermediate and final, were rated from 1 to 7 based on their severity by the authors. The ratings of the outcomes are shown in table 3. A correlational analysis was performed on the severity of downfall and the number of factors present. Some of the downfalls and factors associated with downfalls were correlated (i.e., drug and alcohol addiction, bankruptcy and extramarital affairs). If the type of downfall matched with one of the factors associated with the downfall, the respective factor was not included while determining the number of factors. The results showed that severity of downfall was significantly correlated with the number of factors associated with the downfall, $r = 0.748$, $p < 0.001$.

Table 3. Severity of downfalls (1-least severe, 7-most severe)

Downfall type	Rank
Political lies	1
Extramarital affairs	2
Bankruptcy	3
Drugs and/or alcohol addiction	4
Accidental death due to recklessness	5
Drug-related deaths	6
Suicide	7

» DISCUSSION

The results support the proposed model as three of the five hypotheses were supported and two were partially supported. The results supported the first hypothesis that stars who have crashed have had early childhood experiences of trauma, abandonment, poverty and/or extreme wealth. All of the stars assessed either had childhood difficulties or came from a family with extreme wealth and fame or had early careers.

The second hypothesis that stars who have crashed engaged in assortative relationships/affiliation and the third which states that starts had entourages who supported their narcissistic characteristics were both partially supported, in that roughly one third of the stars showed these effects: a) 33% of the stars whose cases were assessed engaged in assortative relationships and affiliation and b) 27.78% had individuals in their adult environment who reinforced their narcissistic traits.

The fourth hypothesis, that stars who have crashed have engaged in maladaptive behaviors such as making bad financial decisions, alcohol and drug abuse and relationship problems, was supported by the results as 17 out of the 18 stars engaged in at least one of the three maladaptive behaviors and 11 out of the 18 stars engaged in two of the three.

The final hypothesis that the greater the number of risk factors present in the stars, the higher the severity of their downfall, was also supported. The correlational analysis showed a significant positive correlation between the number of risk factors and severity of the downfall. This supports the risk factor model of stars crashing proposed in this study.

Most stars do not crash

Not all stars who have atypical childhoods (difficult childhood, early fame, extremely wealthy or famous family) crash. Barbra Streisand, Oprah Winfrey, Madonna, Natalie Portman and other famous figures managed to survive their stardom without crashing. Oprah Winfrey came from a background of abuse and poverty ("Oprah Winfrey Biography," 2013). Natalie Portman was a child star ("Natalie Portman," 2013). Yet, they rose to success. A logical explanation would be that the resiliency found in people like Oprah Winfrey and Natalie Portman can be attributed to the lack of narcissism in their personalities. Both Oprah and Natalie do not appear to have narcissistic behaviors. Oprah was able to create firm boundaries between herself and her staff

or entourage. Oprah is a philanthropist who devotes her life to the aid of others through charities and activism, even after achieving great success and fame ("Oprah Winfrey Biography," 2013). Natalie prioritized other aspects of her life over fame. She was able to attend regular schools and live a normal childhood. That seems to have prevented her from developing narcissistic behavior. These examples make a good case that narcissism could be the key factor that leads stars to crash and that atypical childhood alone is not sufficient.

Implications

The proposed model suggests risk factors for why certain people are susceptible to crashing, while others in similar situations remain successful. The factors found in the present analysis would be useful in designing interventions for celebrities with behavioral problems. Interventions should consider the impact of social forces on the stars' behaviors. They should also approach the root of the behavior, narcissism, rather than only treating the observable problems of drug and alcohol abuse as isolated events.

Individuals interested in obtaining fame would benefit from these findings as a cautionary measure that may prepare them for the risks that accompany the life of a famous star.

Limitations

Although the proposed model shows narcissism as the key factor in leading stars to crash, the study could not directly assess prevalence of narcissistic traits in the stars whose lives were assessed. This was mainly because of geographical distance or death of the stars being studied. The study assumed that the stars being studied had narcissistic tendencies. There is enough anecdotal information to support the assumption that certain celebrities are narcissistic. This assumption is also supported by research literature that was discussed earlier in the paper.

Another limitation was that it is difficult to obtain biographical information on stars in general. The ones that are of interest to the public, and therefore have detailed biographies, are often the ones who have had troubled lives. Because of the nature of the population group being studied in this paper, the paper used secondary sources to analyze the lives of the participants. Conducting interviews and administering surveys/instruments to examine the variables of interest was not possible.

Another difficulty we faced in this study was discerning a few risk factors such as drug or alcohol abuse, relationship problems and bad financial decisions from intermediate outcomes such as drug addition, political lies, extramarital affairs and bankruptcy. In a descriptive naturalistic study such as this one, it is not possible to control all the variables. The variables studied were a chain of events. Sometimes, the event is an outcome and sometimes it is a cause. What is a risk factor and what is an outcome depends on where one looks in the chain that exists in reality. To minimize the effects of this problem, in the correlational analysis, the association between numbers of risk factors present and the severity of outcomes, the risk factors that overlapped with the outcomes were excluded.

Direction for future research

Future research can also expand on this study by studying a larger number of cases. It would also be extremely useful to study the stars that do not crash. What sets them apart? Future research might use statistical methods to compare the circumstances of stars that crash to those who do not.

If possible, it would be helpful to do a longitudinal study of stars assessing their narcissism by administering instruments. An interesting addition would also include an examination of stars who were dealing with severe problems, but managed to recover and remain in or return to stardom. ■

REFERENCES

Anderson, N. (1978). Interview with Vernon Presley. *Elvis Australia.* Retrieved June 20, 2013, from http://www.elvis.com.au/presley/interview_with_vernon_presley_1978.shtml#sthash.jbLZJ8vu.dpbs

Baker, P. & Dewar, H. (1999, February). The senate acquits president Clinton [Online news article]. Retrieved from http://www.washingtonpost.com/wpsrv/politics/special/clinton/stories/impeach021399.htm

Beatson, J. A. (1995). Long term psychotherapy in borderline and narcissistic disorders: When is it necessary? *Australian and New Zealand Journal of Psychiatry*, *29*(4), 591-597.

Berman, J., Clarke, S. & Parise, S. (2010, August). Elin Nordegren on Tiger Woods: I was "blindsided" by affairs, she tells People Magazine [Online news article]. Retrieved from http://abcnews.go.com/Entertainment/elin-nordegren-opens-tiger-woods-affairs-divorce-people/story?id=11473930

Bill Clinton Biography.(n.d.).*The Biography Channel website*. Retrieved June 20, 2013a, from http://www.biography.com/people/bill-clinton-9251236

Bill Clinton Biography.(n.d.).*The History Channel website*. Retrieved June 20, 2013b, from http://www.history.co.uk/biographies/bill-clinton.html

Biography of Richard Milhous Nixon.(n.d.). Retrieved June 20, 2013, from http://www.nixonlibrary.gov/thelife/nixonbio.pdf

Bohn, K. (2011, June). John Edwards pleads not guilty to conspiracy, campaign law violations [Online news article]. Retrieved from http://www.cnn.com/2011/POLITICS/06/03/edwards.case/index.html

Bon, O. L., Hansenne, M., Amaru, D., Albert, A., Ansseau, M., & Dupont, S. (2013). Assortative mating and personality in human couples: A study using Cloninger's temperament and character inventory. *Psychology*, *4(1)*, 11-18. Retrieved from http://search.proquest.com/docview/1318921069?accountid=12605

Brandon, L. (2012). Sex, drugs, and rock and roll-the problem with drugs and celebrity. *Hypable.com.* Retrieved August 1, 2013, from http://www.hypable.com/2012/02/26/sex-drugs-and-rock-and-roll-the-problem-with-drugs-and-celebrity/

Brennan, K. A., & Shaver, P. R. (1998). Attachment styles and personality disorders: Their connections to each other and to parental divorce, parental death, and perceptions of parental caregiving. *Journal Of Personality*, 66(5), 835-878. doi:10.1111/1467-6494.00034

Brockes, E. (2013). Charlie Sheen: The road to rehab. *The Guardian.* Retrieved from http://www.guardian.co.uk/culture/2013/feb/01/charlie-sheen-interview

Brown, W.J., Basil, M.D., & Bocarnea, M.C. (2003). The influence of famous athletes on health beliefs and practices: Mark McGwire, child abuse prevention, and androstenedione. *Journal of Health Communication, 8*(1), 41-57. doi:10.1080/10810730305733

Capron, E.W. (2004). Types of pampering and the narcissistic personality trait. *Journal of Individual Psychology*,*60*(1), 76-93

Celebrity.(n.d.). In *Wikipedia.* Retrieved July 31, 2013, from https://en.wikipedia.org/wiki/Celebrity

Celebrities in rehab: Stars who battled addiction and more. (2013). *Huffington Post.* Retrieved July 31, 2013, from http://www.huffingtonpost.com/2013/04/02/celebrities-rehab-stars-addiction-photos_n_3001702.html#slide=2292542

Celedonia, L.K. & Williams, N.E. (2006). Craving the spotlight: Buddhism, narcissism, and the desire for fame. *The Journal of Transpersonal Psychology, 38*(2), 216-224.

Charlie Parker Biography.(n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.biography.com/people/charlie-parker-9433413?page=2

Charlie Sheen Biography.(n.d.).*The Biography Channel website*. Retrieved June 20, 2013, from http://www.biography.com/people/charlie-sheen-9481297

Distefan, J.M., Pierce, J.P., & Gilpin, E.A. (2004). Do favorite movie stars influence adolescent smoking initiation? *American Journal of Public Health, 94*(7), 1239-1244.

Dix, S., Phau, I., & Pougnet, S. (2010). 'Bend it like beckham': The influence of sports celebrities on young adult consumers. *Young Consumers, 11*(1), 36-46. doi:10.1108/17473611011025993

Duke.A. (2013, May). Lindsay Lohan talks drugs, booze, rehab, sex [Online news article]. Retrieved from http://www.cnn.com/2013/05/05/showbiz/lindsay-lohan-rehab/index.html

Elvis Presley Biography.(n.d.).*The Biography Channel website*. *Bio True Story.* Retrieved June 20, 2013, from http://www.biography.com/people/elvis-presley-9446466?page=2

Fischer, M.J. (2012). Narcissism and the process of entering into substance dependence: A qualitative investigation. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 73*(4). 2012-99190-559

Foster, J.D., Misra, T.A. &Reidy, D.E. (2009). Narcissists are approach-oriented toward their money and their friends. *Journal of Research in Personality, 43*, 764–769.

Foster, J.D., Reidy, D.E., Misra, T.A., & Goff, J.S. (2011). Narcissism and stock market investing: Correlates and consequences of cocksure investing. *Personality and Individual Differences*, *50*(6), 816-821. doi:10.1016/j.paid.2011.01.002

Freeman, A., & Fox, S. (2013). Cognitive behavioral perspectives on the theory and treatment of the narcissistic character. In J.S. Ogrodniczuk (Ed.), Understanding and treating pathological narcissism (pp. 301-320). Washington, DC US: American Psychological Association. doi:10.1037/14041-018

Giles, D.C., & Maltby, J. (2004). The role of media figures in adolescent development: Relations between autonomy, attachment, and interest in celebrities. *Personality & Individual Differences, 36*(4), 813. doi:10.1016/S0191-8869(03)00154-5

Goldman, G.F., & Gelso, C.J. (1997).Kohut's theory of narcissism and adolescent drug abuse treatment. *Psychoanalytic Psychology, 14*(1), 81-94. doi:10.1037/h0079725

Greenwood, D., Long, C.R., Dal Cin, S. (2013). Fame and the social self: The need to belong, narcissism, and relatedness predict the appeal of fame. *Personality and Individual Differences.*

Grinker, R.R. (1978). The poor rich: The children of the super-rich. *The American Journal of Psychiatry*, 135(8), 913-916.

Heath Ledger.(n.d.).*Wikipedia.* Retrieved July 8, 2013, from http://en.wikipedia.org/wiki/Heath_Ledger

Heath Ledger Biography.(n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.thebiographychannel.co.uk/biographies/heath-ledger.html

Hibbard, S. (1993). Adult children of alcoholics: Narcissism, shame, and the differential effects of paternal and maternal alcoholism. *Psychiatry, 56*(2), 153-62.

Irwin, H. (1995). Codependence, narcissism, and childhood trauma.[Abstract]. *Journal of Clinical Psychology, 51*(5), 658-665. doi: 10.1002/1097-4679(199509)51:5<658::AID-JCLP2270510511>3.0.CO;2-N

James Dean Biography. (n.d.). *James Dean.* Retrieved June 20, 2013(a), from http://jamesdean.com/about/bio.html

James Dean Biography. (n.d.). In *Encyclopedia of World Biographies.* Retrieved June 20, 2013(b), from http://www.notablebiographies.com/De-Du/Dean-James.html

John Edwards Biography.(n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.biography.com/people/john-edwards-11158797

Judy Garland Biography.(n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.biography.com/people/judy-garland-9306838

Kemp, M. (n.d.).Elvis Presley Biography. *The Rolling Stone*. Retrieved June 20, 2013, from http://www.rollingstone.com/music/artists/elvis-presley/biography

Kordik, A., Eska, K., & Schultheiss, O.C. (2012). Implicit need for affiliation is associated with increased corrugator activity in a non-positive, but not in a positive social interaction. *Journal of Research in Personality, 46*(5), 604-608. doi:http://dx.doi.org.proxy.mtholyoke.edu:2048/10.1016/j.jrp.2012.05.006

Koestner, R., McClelland, D.C., 1992.The affiliation motive. In: Smith, C.P. (Ed.), *Motivation and Personality: Handbook of Thematic Content Analysis*. Cambridge Univ. Press, New York, pp. 205– 210.

Krizan, Z., &Bushman, B.J. (2011). Better than my loved ones: Social comparison tendencies among narcissists. *Personality and Individual Differences, 50*(2), 212-216. doi:10.1016/j.paid.2010.09.031

Kurt Cobain Biography. (n.d.). *The Biography Channel website.* Retrieved June 20, 2013, from http://www.thebiographychannel.co.uk/biographies/kurt-cobain.html

Lakey, C.E., Rose, P., Campbell, W.K., & Goodie, A.S. (2008).Probing the link between narcissism and gambling: The mediating role of judgment and decision-making biases [Abstract]. *Journal of Behavioral Decision Making, 21*(2), 113-137. doi:10.1002/bdm.582

Lenny Bruce. (n.d.). In *Wikipedia.* Retrieved June 25, 2013, from http://en.wikipedia.org/wiki/Lenny_Bruce

Lindsay Lohan Biography. (n.d.). *The Biography Channel website.* Retrieved June 25, 2013, from http://www.thebiographychannel.co.uk/biographies/lindsay-lohan.html

Loder, K. (2009). Nirvana's Kurt Cobain: still missed. *MTV*. Retrieved from http://www.mtv.com/news/articles/1608771/nirvanas-kurt-cobain-still-missed-by-kurt-loder.jhtml

Luhtanen, R.K., & Crocker, J. (2005). Alcohol use in college students: Effects of level of self-esteem, narcissism, and contingencies of self-worth. *Psychology of Addictive Behaviors, 19*(1), 99-103. doi:10.1037/0893-164X.19.1.99

Luthar, S.S., &Latendresse, S.J. (2005). Children of the affluent: Challenges to well-being. *Current Directions in Psychological Science*, *14*(1), 49-53. doi:10.1111/j.0963-7214.2005.00333.x

Magic Johnson.(n.d.).In *Wikipedia.* Retrieved July 2, 2013, from http://en.wikipedia.org/wiki/Magic_Johnson#Early_years

Magic Johnson Biography.(n.d.).*The Biography Channel website.* Retrieved July 2, 2013a, from http://www.biography.com/people/magic-johnson-9356150

Magic Johnson Biography.(n.d.).*ESPN website.* Retrieved June 20, 2013b, from http://espn.go.com/nba/player/bio/_/id/2334/magic-johnson

Maltby, J., McCutcheon, L., Ashe, D., & Houran, J. (2001).The self-reported psychological well-being of celebrity worshippers. *North American Journal of Psychology, 3 (3),* 441-452.

Mandelbaum, A. (1980). Family characteristics of patients with borderline and narcissistic disorders. *Bulletin of the Menninger Clinic, 44*(2), 201-211.

Manfred, T. (2013). 21 ways professional athletes go broke. *Business Insider.* Retrieved August 1, 2013, from http://www.businessinsider.com/examples-of-athletes-going-broke-2013-3#

Marilyn Monroe Biography.(n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.thebiographychannel.co.uk/biographies/marilyn-monroe.html

Marmar, C.R., & Freeman, M. (1988). Brief dynamic psychotherapy of post-traumatic stress disorders: Management of narcissistic regression. *Journal of Traumatic Stress, 1*(3), 323-337. doi:10.1002/jts.2490010305

M.C. Hammer Biography. (n.d.).*The Biography Channel website.* Retrieved June 20, 2013, from http://www.biography.com/people/mc-hammer-21212639?page=2

McKay, H. (2010). Inside the Hollywood drug scene: how celebrities get their fix. *FoxNews.com.* Retrieved August 9, 2013, from http://www.foxnews.com/entertainment/2010/09/28/inside-hollywood-drug-scene-celebrities-fix/

Mishne, J. (1979). Parental abandonment: A unique form of loss and narcissistic injury. *Clinical Social Work Journal, 7*(1), 15-33. doi:10.1007/BF00761356

Mitchell, A. (1998, December). Impeachment: The overview—Clinton impeached; He faces a senate trial, 2D in history; Vows to do job till term's 'last hour' [Online news article]. Retrieved from http://www.nytimes.com/1998/12/20/us/impeachment-overview-clinton-impeached-he-faces-senate-trial-2d-history-vows-job.html?pagewanted=all&src=pm

Natalie Portman. (n.d.). In *Wikipedia.* Retrieved July 8, 2013, from http://en.wikipedia.org/wiki/Natalie_Portman

Need for affiliation. (n.d.).In *Wikipedia.*Retrieved on August 8, 2013, from http://en.wikipedia.org/wiki/Need_for_affiliation#cite_ref-1

New Album from Selena Quintanilla 17 Years After Her Death. (2012). *Fox News Latino.* Retrieved from http://latino.foxnews.com/latino/entertainment/2012/04/04/new-album-from-selena-quintanilla-17-years-after-her-death/

Nicholls, E., &Stukas, A.A. (2011). Narcissism and the self-evaluation maintenance model: Effects of social comparison threats on relationship closeness. *Journal of Social Psychology, 151*(2), 201-212. doi:10.1080/00224540903510852

Parker, F.M., Faulk, D., &LoBello, S.G. (2003). Assessing codependency and family pathology in nursing students. *Journal of Addictions Nursing, 14*(2), 85-90. doi:10.1080/10884600390230484

Radó, S. (1933).The psychoanalysis of pharmacothymia (drug addiction). *The Psychoanalytic Quarterly, 2*, 1-23.

Ricky Nelson. *(n.d.).*In *Wikipedia.*Retrieved June 20, 2013, from http://en.wikipedia.org/wiki/Ricky_Nelson#Personal_life

Rick Nelson Biography. (n.d.). *Rickynelson.com.* Retrieved June 20, 2013, from http://rickynelson.com/indexold.html

Roche, M.J., Pincus, A.L., Conroy, D.E., Hyde, A.L., & Ram, N. (2012). Pathological narcissism and interpersonal behavior in daily life. *Personality Disorders: Theory, Research, and Treatment*, doi:10.1037/a0030798

Ronningstam, E., & Gunderson, J.G. (1990). Identifying criteria for narcissistic personality disorder. *The American Journal of Psychiatry, 147*(7), 918-922.

Schaller, M. (1997). The Psychological Consequences of Fame: Three Tests of the Self-Consciousness Hypothesis. *Journal of Personality,* 65(2), 291-309.

Selena.(n.d.).In *Wikipedia.*Retrieved July 9, 2013, from http://en.wikipedia.org/wiki/Selena

Sid Vicious.(n.d.).In *Wikipedia.*Retrieved July 19, 2013, from http://en.wikipedia.org/wiki/Sid_Vicious

Star.(2013). In *Merriam-Webster.com*. Retrieved July 16, 2013, from http://www.merriam-webster.com/dictionary/star

Sterling, S.T. (2012). Top 10 rock star drug overdoses. *KROQ.* Retrieved from http://kroq.cbslocal.com/2012/11/20/top-10-rock-star-drug-overdoses/

Tanchotsrinon, P., Maneesri, K., & Campbell, W.K. (2007). Narcissism and romantic attraction: Evidence from a collectivistic culture. *Journal of Research in Personality,41*(3), 723-730. doi:10.1016/j.jrp.2006.08.004

The hot new celeb? Sarah! (2008). *Thedailybeast.com.* Retrieved July 31, 2013, from http://www.thedailybeast.com/newsweek/2008/09/03/the-hot-new-celeb-sarah.html

The White House.(2013). *Richard M. Nixon.* Retrieved from http://www.whitehouse.gov/about/presidents/richardnixon

The Associated Press, Another comeback kid? John Edwards reactivates law license, books speaking gig. (2013). Retrieved fromhttp://www.nydailynews.com/news/politics/john-edwards-reactivates-law-license-books-speaking-gig-article-1.1346962

Thiessen, D., Young, R.K., & Delgado, M. (1997). Social pressures for assortative mating. *Personality and Individual Differences, 22*(2), 157-164. doi:http://dx.doi.org.proxy.mtholyoke.edu:2048/10.1016/S0191-8869(96)00181-X

Tiebout, H.M. (1994). The ego factors in surrender in alcoholism. In J.D. Levin, & R.H. Weiss (Eds.), (pp. 148-157). Lanham, MD US: Jason Aronson. Tiger Woods. (n.d.). In *Wikipedia.* Retrieved July 10, 2013, from http://en.wikipedia.org/wiki/Tiger_Woods

Tiger Woods Biography.(n.d.). *The Biography Channel website.* Retrieved June 20, 2013a, from http://www.thebiographychannel.co.uk/biographies/tiger-woods.html

Tiger Woods Biography.(n.d.). *Jockbio.com.* Retrieved June 20, 2013b, from http://www.jockbio.com/Bios/T_Woods/T_Woods_bio.html

Young, M.S. & Pinsky, D. (2006). Narcissism and Celebrity. *Journal of Research in Personality,* 40, 463–471.

Venezia, T. (2009, December). Tiger to suffer a '$180M' slice [Online news article]. Retrieved from http://nypost.com/2009/12/13/tiger-to-suffer-a-180m-slice/

Veer, E., Becirovic, I., & Martin, B.A.S. (2010). If kate voted conservative, would you? the role of celebrity endorsements in political party advertising. *European Journal of Marketing, 44*(3-4), 436-450. doi:10.1108/03090561011020516

Vinton, N. & Red, C. (2013, March). Tiger Woods is back as the No. 1 golfer in the world, but has more work to do to restore image and win back sponsors [Online news article]. Retrieved from http://www.nydailynews.com/sports/more-sports/tiger-work-restore-image-article-1.1303433

Wrong side of the tracks: 10 celebrities who overcame their pasts. (2008). *Customizedgirl.com.* Retrieved July 31, 2013, from http://www.customizedgirl.com/blog/?p=397

BEHAVIORAL DEVELOPMENT BULLETIN

VOLUME 19
NUMBER 2
JULY 2014

Furthering a behavior analytic account of self-control using relational frame theory

Autumn N. McKeel[1] and Mark R. Dixon[2]

1 Department of Applied Behavior Analysis, Aurora University
2 Rehabilitation Institute, Southern Illinois University, Carbondale

ABSTRACT

The understanding of self-control from a behavior analytic perspective has developed over the past several decades. Researchers have refined the concept of self-control and developed empirical interventions to support the utilization of self-control training in translational and applied settings. This paper describes self-control training, how interventions have been implemented, and suggestions for future research. Future directions include implementing self-control training procedures from a Relational Frame Theory perspective.

KEYWORDS: self-control, impulsivity, relational frame theory, acceptance & commitment therapy

The diagnostic and statistical manual, 5th edition (DSM-V) of psychiatric disorders, which is widely used to categorize mental disorders, characterizes "impulsive behaviors" into disorders that are deemed as "non-optimal" in society (American Psychiatric Association, 2013). An entire chapter entitled, "Disruptive, Impulse Control, and Conduct Disorders" describes oppositional defiant disorder, conduct disorder, and disruptive behavior disorder. Defining features of these disorders include having an impulse, an urge, guilt, or failure to control impulses. These labels characterize individuals by attaching descriptions to them based on their behaviors. However, a behavior analytic perspective seeks to describe impulsivity as more of a characteristic of one's responding. It is important to follow an objective, operational definition of "impulse control" rather than to use hypothetical constructs to describe such concept. Self-control is a term used to define the opposite of impulsivity. There is much utility in addressing self-control from a behavior analytic perspective, and there are implications in furthering interventions in this area.

» OPERATIONALLY DEFINING SELF-CONTROL

Behavioral researchers have proposed a definition of "impulsivity" as the allocation towards a response option that is available immediately, rather than an option that is more advantageous, but typically delayed in time (Mischel, Ebbesen, & Zeiss, 1972; Neef, Bicard, & Endo, 2001; Schweitzer & Sulzer-Azaroff, 1998). More specifically, it is more appropriate to measure choice making behaviors. It has been described that the impulsive choice is selected when the participant chooses the smaller, more immediate reinforcer. The choice is deemed to be a self-controlled choice if the participant chooses the larger, more delayed reinforcer over a smaller, immediate reinforcer. As a result, the abstraction that self-control is a private event is minimized, if not eliminated. Instead, only the choices that are made and observed are considered within the definition. This behavioral conceptualization has provided a great deal of utility over the past few decades by operationally defining "impulsive" behavior and developing interventions that shift behavior towards more optimal choice making.

It has been shown that individuals with "impulsive" behaviors, such as those diagnosed with having an Disruptive, Impulse Control, and Conduct Disorder (American Psychiatric Association, 2013) more often choose the smaller, more immediate reinforcer over the larger, more delayed reinforcer when compared to individuals who have not been diagnosed with these "impulsive" characteristics and disorders. (Neef et. al., 2001; Neef et. al., 2005, Schweitzer & Sulzer-Azaroff, 1988). One of the goals of a behavior analyst, whether a scientist or a clinician, is to be able to predict and control behaviors, and this may require more time and effort when dealing with impulsive choices as opposed to dealing with individuals who display the ability to wait a long period of time to get what they want. For example, the child with impulsive behaviors in the classroom may choose to partake in out of seat behavior prior to completing his work at his desk. It is more immediately reinforcing for him to avoid his homework, but the more delayed reinforcer, receiving out of seat time for completing his homework, would be a larger reinforcer. In another example, the pathological gambler may make the "impulsive" choice to go to the casino to play slot machines rather than stay home and spend

Correspondence concerning this article should be addressed to Autumn McKeel, Aurora University, Applied Behavior Analysis, 347 S Gladstone Ave, Aurora, IL 60506. E-mail: amckeel@aurora.edu.

time with his family which would lead to the larger, more delayed, reinforcer of investing money and time for his family. Behavior analysts have contributed a considerable amount of research, time, and effort in finding successful techniques to predict and control these "impulsive" choices. Research has shown that these choices can be environmentally manipulated.

Basic laboratory, non-human behavior analytic research evaluated choice making in organisms. While these early studies utilized rats or pigeons as experimental subjects, the intention was always to allow for generalization to human performance. Ferster (1953) evaluated long delays of reinforcement with pigeons. As the duration of the delays increased, the rate of responding became progressively lower. The pigeon' pecking was conditioned on a variable-interval schedule of reinforcement by gradually increasing the delays to which they received reinforcement. The study, beginning in the laboratory, was altered slightly to contribute to the definition of self-control. Rachlin and Green (1974) manipulated the original training by offering the choice prior to the training. The authors found that the pigeons were able to make and commit to a self-controlled choice. Ainslie (1974) evaluated pigeons pecking on a single key which they had the choice of a smaller, immediate reinforcer if they pecked the key, or a larger, delayed reinforcer for not pecking the key. Almost all of the subjects followed this training to what was expected. Grosch and Neuringer (1981) conducted a similar study with pigeons. This study was unique in its utilization of concurrent activity in the experimental chamber that had no impact on the programmed reinforcement contingencies. The pigeon pecking was immediately reinforced with a less preferred grain when the pigeons pecked an illuminated key immediately, whereas if they waited, pecking was reinforced with a more preferred grain. The delayed interval was gradually increased to 15 s. The effects of the presence and absence of the reinforcers were examined. The results showed that none of them waited successfully when both rewards (less preferred and more preferred grain) were present as compared to when they were absent. These results are opposite of what one may have hypothesized.

Since then, researchers have described self-control as the opposite of impulsivity, more specifically as choosing a larger, delayed reinforcer over a smaller, immediate reinforcer (Grosch & Neuringer, 1981; Logue, Pena-Correal, Rodriguez, & Kabela, 1986). The standard self-control training procedures conducted with animals have been shown to have similar effects with humans. Such studies have shown that environmental manipulations as delaying time to contact the more optimal choice play a large role in choice making. It may be that contacting the contingency of the more optimal choice for animals and humans is necessary to learn to make better choices. On the other hand, there is a great difference between animals and humans; therefore, it is imperative that scientists evaluate the similarities and differences in choice making abilities and interventions in both.

Choice making can certainly be manipulated in animals, but the goal was not just to show the ability to do so, rather, it was to show that this model is effective with humans. Early human studies explored the application of both fading delays and concurrent activities that were to be emitted during the delay period (of the self-control training). Some research used a single technique to produce self-control in initially impulsive participants, while others combined both methods to produce choice alterations and clinical behavior goals. Mischel, Ebbeson, and Zeis (1972) enhanced tolerance for delay intervals by teaching self-control. Impulsivity is a targeted behavior in many populations, including those who have autism, developmental disabilities, brain injuries, or even in young children who are typically developing. Schweitzer and Sulzer-Azaroff (1988) taught young children to wait for a delayed reinforcer. This was done by gradually increasing the delay between the choice and receiving a larger reinforcer over receiving a smaller, immediate reinforcer. The participants were chosen due to their impulsive behaviors. Several studies (Neef, Bicard, & Endo, 2001; Neef, Bicard, Endo, Coury, & Aman, 2005; Neef, Marckel, Ferreri, Bicard, Endo, Aman, Miller, Jung, Nist, & Armstrong, 2005) have assessed students who were diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). Impulsivity was measured by assessing the children's sensitivity to rate, quality, immediacy, and effort while completing math problems. The results of the assessment showed that the participants were impulsive, according to the diagnostic criteria for ADHD. The results of the assessments and studies showed that self-control could be established by progressively delaying the time to meet a larger reinforcer.

An additional study that capitalized on the fading of delays was by Jackson and Hackenberg (1996). Similar to the early animal work of previous studies (Grosch & Neuringer, 1981; Ferster, 1953), this study used token reinforcement and choice to train pigeons in self-control. Specifically, pigeons were exposed to procedures that involved illumination as token reinforcement. Initially, subjects preferred the immediate presentation to the delayed presentation. All subjects preferred the delayed three illuminations more often than previously after being exposed to gradual fading of delays to the reinforcement. Together, this previous research suggests that the incorporation of the delay fading procedure will result in a participant initially deemed "impulsive" to now improve their optimal choice making and be, to some degree, "self-controlled." Stromer, McComas, and Rehfeldt (2000) discussed the laboratory research and the applied implications of delayed reinforcement in regards to self-control. They agreed that self-control can be defined as displaying the ability to delay gratification by responding to a larger, more delayed reinforcer over a smaller, immediate one. Other sources agree that an individual may behave in a manner to change a subsequent behavior when making choices (Cooper, Heron, & Heward, 2007; Schweitzer & Sulzer-Arazoff, 1988; Skinner, 1948). After being exposed to gradual fading of delays to the reinforcement, the pigeons preferred the delayed reinforcer. Jackson and Hackenberg (1996) also suggest that token reinforcement (e.g. money) versus primary reinforcement (e.g. food items) serves as a difference between impulsive choice making in animals and humans. It may be appropriate to further examine the differences between the implementation of self-control techniques in animals and humans. This may give researchers more insight as to how humans develop complex psychiatric and impulse control disorders, as these are clear differences between animals and humans.

Logue (1996) researched and theorized the effectiveness of self-control training with both animals and humans. He compared self-control with what is known as self-regulation (Baumeister & Heatherton, 1996) in psychology research. Self-regulation is described to be the ability to control oneself even though one may have the impulse to choose an immediate reinforcer rather than wait for a more optimal choice. Logue explains the similarities of the two and that behavioral scientists have developed and coined the term self-control as a way to operationally define the opposite of making impulsive choices. Baumeister and Heatherton (1996) explain that addicts, those who are violent, and teen pregnancy are all social problems that occur due to a failure of "self-regulation."

To date, the approaches that have utilized and altered the standard self-control training may have limitations as they have covered specific populations and settings. This may be because the reinforcer delay or the magnitude of the reinforcer alone cannot predict the choice, and choice does not solely depend on smaller and larger reinforcers. Since manipulating reinforcers and contingencies may not be the final answer in favorably altering choice making, it may be appropriate to address function, as a form of assessment, treatment, and evaluation of the development of impulsive choice making.

Some studies on self-control have contributed to the research by assessing the function of the problem behavior and then addressing treatment based on the function of the behavior. For example, Vollmer, Borerro, Lalli, and Daniel (1999) evaluated self-control by assessing the function of the impulsive behaviors and implementing Functional Communication Training (FCT). They showed that the delay to reinforcement might not be the only factor that influences self-control; rather a functional analysis is imperative to affirm that problem behavior does not continue to receive reinforcement.

Further research has assessed evaluations and testing measures of impulsive behaviors in humans. Dougherty, Mathias, Marsh-Richard, Furr, Nouvion, and Dawes (2009) conceptualized three different categories of impulsivity in humans. They included response initiation, response inhibition, and consequence sensitivity. Response initiation can be defined as impulsive responding prior to the complete evaluation of a stimulus. This is often tested with quick displays of stimuli while the participant must identify and respond to the correct stimuli. If the participant identifies the incorrect stimulus, the response is deemed impulsive. Response inhibition is defined as the failure to inhibit a response, which has been initiated. An example of this may be when a participant is instructed to inhibit a response under particular rules (Dougherty, Steinberg, Wasseff, Medearis, Cherek, & Moeller, 1998; Dougherty, Marsh, Mathias, & Swann, 2005). A response to the incorrect stimulus or under incorrect circumstances would constitute an impulsive response (Forzano, Michels, Carapella, Conway, & Chelonis, 2011; Logan, Schachar, & Tannock, 1997). The third type of impulsivity is consequence-sensitivity. This is also known as the manipulation of rewards and delays of reinforcement. An example of this is when a participant chooses a small, immediate reinforcer even though there may be a more optimal choice. The research on self-control is included in this third category of impulsivity. The majority of this paper discusses the consequence-sensitivity type of impulsivity. Behavioral explanations and measurements of impulsivity tend to have more empirical support in the description of impulsivity compared to trait-based assessments such as assessments for ADHD diagnoses. In respect to the third type, consequence-sensitivity, Forzano et al. (2011), examined the validity between the measures of self-control and delay-of-gratification in a table top task with children. The authors examined the rate that the participants switched their choice to an impulsive choice when compared to the self-controlled choice. The results showed a positive correlation between the measures. The children switched their choices in several less trials when compared to studies that examined this in animals, particularly pigeons (Logue & Peña-Correal, 1984).

Additional self-control studies have addressed various clinical populations in a variety of settings (Dixon & Falcomata, 2004; Dixon & Holcomb, 2009; Falcomata & Dixon, 2004; Hoerger & Mace, 2006; Hyten, Madden, & Field, 1994; Sonuga-Barke, Taylor, Sembi, & Smith, 1992). Most approaches to altering preference toward larger and more delayed reinforcers have required a significant amount of training and direct reinforcement for the participant. However, there are times that such actual exposure is time prohibited or logistically impossible. Questions arise as to whether such techniques are continuously effective in populations that have not been evaluated yet. Thus far, it has been shown that the standard self-control training protocols can be used in the basic laboratory settings with animals and humans and in such populations as individuals with developmental disabilities, autism, and brain injuries. Although there have been techniques to prolong the toleration of time to obtain a reinforcer, it does not completely support whether external validity exists with the populations discussed earlier who may fall into the category of having impulse control disorders. The consequences with behaviors related to these disorders are significant, and the delays associated with making the optimal choice are oftentimes far in the future. This makes it very difficult to perform the standard interventions if one cannot expose the individual to the long awaited optimal choice. It is, therefore, critical to examine if we might be able to alter preferences between response alternatives without embarking on extensive contingency shaped protocols.

» AN UNEXPECTED FINDING

As described, there are a variety of ways to teach self-control. While studies have shown the utilization of a standard self-control training procedure and variations of it, research has also shown that processes other than directly training the individual to delay their choice may play a role in manipulating responses. Verbal behavior and rule governed behavior has played a role in self-control training procedures with humans. Binder, Dixon, and Ghezzi (2000) examined the preferences chosen by children who have ADHD to select delayed reinforcers. The effect of verbal mediation to teach self-control was also demonstrated. If the child chose the larger reinforcer, he or she was variably instructed to repeat the self-rule, "If I wait longer, I will get the bigger one," or to label pictures presented on flash cards. Results showed that preference for the larger, delayed reinforcer remained high throughout both training conditions. Dixon and Cummings (2001) also used the verbal self-rule when instructing the self-control training. They exposed participants to a concurrent fixed-duration/progressive duration schedule of

reinforcement to decrease problem behavior. As conducted in this research team's prior self-control studies, the naturalistic baseline was taken by recording the duration of time it took for each of the three children to access the reinforcer when they were instructed to, "wait as long as you can before eating (or playing) with this." Results found that all participants chose the larger reinforcer contingent upon the activity completion, and no problem behaviors occurred. Dixon and Tibbetts (2009) extended previous research by adding a choice of task performance during the self-control training. The participants were given choices of a small reinforcer immediately or a larger progressively delayed reinforcer whose values were determined by a die roll. The results indicated that since there was a preference for self-rolling rather than the experimenter to roll the die, there may be self-rules involved in the outcome.

The concept of self-control has been found to be brought in via indirect contingencies rather than only by directly contriving delayed reinforcement in order to train delayed choice making. Finding that more optimal choice making can be the outcome of relational training gives many implications to developing practical interventions in the real world setting. For example, a rather novel study by Dixon and Holton (2009) demonstrated how responses potentially deemed impulsive could be minimized without ever a) instructing the subject to alter responding, and more interestingly, b) without ever providing reinforcement for making a more optimal self-controlled response. Instead, in this study, preference was altered by "verbal mediation." It was initially found that all participants tended to make a high proportion of choices for this smaller immediate option. However, when exposed to a procedure termed "conditional discrimination training/testing," responding was altered such that more choices were now made for the larger delayed reinforcers.

The above study utilized an independent variable manipulation that was rooted conceptually in the behavioral theory termed "Relational Frame Theory" (RFT), (Hayes, Barnes-Holmes, & Roche, 2001), which is a theory of human language and cognition. This approach explains the phenomenon that humans relationally respond to stimuli and to other humans. Although there has been productive research with animals that serve as a model for examining human behavior, the verbal abilities of humans contribute to the complexity of human behavior; and these characteristics and cannot be shown with animals. It may be that humans learn to make particular choices through relations, and if this is the case, this account can also be applied to alter those relations. This "relational responding" can be described behaviorally as arbitrary applicable responding or responding through derived relational responses. The behavioral explanation of relational responding can be described in three properties including mutual entailment, combinatorial entailment, and transformation of stimulus function. The first, mutual entailment is the relation that if stimulus A is the same as stimulus B in a particular context, a derived relation of B to A occurs. The second property of combinatorial entailment occurs when a stimulus A may be related to a stimulus B and a stimulus C, separately. A derived relation between stimuli B and C automatically occurs without direct training. The third property of relational responding is the transformation of functions whereby a stimulus function shows transfer from one stimulus to another (Hayes, Barnes Holmes, & Roche, 2001; Hayes & Wilson, 1993). Most importantly, it assumes that choices made by a verbally sophisticated human are not solely due to the programmed reinforcers that come from the choices made. Instead, choice is more contextual, consisting of participating factors such as rules, self-rules, stimulus functions, and reinforcement.

Additional such studies have been conducted in order to support the use of contextual cues to establish the transformation of function. Conditional discrimination training has been conducted in several various settings and has been effective in altering functions of stimuli (Hoon, Dymond, Jackson, & Dixon, 2008; Johnson & Dixon, 2009; Nastally, Dixon, & Jackson, 2010; Zlomke & Dixon, 2006). Contextual features influence how we relate events, whether they are through functions or topographical features (Hayes et al., 2001). In addition to the existing training procedures, altering stimulus functions (from a RFT perspective) with larger, delayed reinforcers and smaller, immediate reinforcers gives implication to further behavior analytic procedures that will result in self-controlled responding.

Hayes et al. (2001) discuss the verbal analysis of delay and the reduction of impulsivity by explaining the role of language in relation to temporal events. RFT's transformation of function plays a large role in forming different frames of relations, including temporal relations. Temporal relations are an abstract relation that develops through a history of contingencies of reinforcement as well as stimulus transformations. The authors describe relational frames and note that temporal relations are especially relative to learning through relations because of understanding the past, present, and future of time. Many of the self-control training research studies have evaluated choices between now and sometime in the future by waiting or participating in a task in order to reach that time delay. Other research in the area has evaluated a variety of functions, such as "more" and "less," without directly training the concept. McKeel and Dixon (under review) replicated previous research by training children with ADHD, behavior disorders, and brain injuries to modify impulsive behaviors to become self-controlled behaviors. Conditional discrimination training was conducted to train arbitrary functions to various stimuli that represented the values of "more than" or "less than." The conditional discrimination training was implemented in place of the standard self-control training, which presented progressive delays in concurrent options. The children shifted their preference to a particular item without having a history of reinforcement with the stimuli. It suggests that a history of reinforcement does not always heed responses based on the trained arbitrary figures during the matching-to-sample procedure. A language-based approach (RFT) was shown to be an effective intervention to alter the manipulation of delays. The children's initial responses of choosing the impulsive choice may have been to avoid doing the work, but by training the context of the value of "more-than," they were able to perform a task for a longer period of time. In addition to the temporal relations and comparison frames, future relations addressed in such procedures should include other relational frames such as conditionality. For example, if a child is influenced by a verbal rule of, "If I do A, I will receive B," altering stimuli in this frame may result in optimal choice making.

The principles that explain RFT were an effective way to alter choice making in the previous procedure. If the development of such disorders and impulsive choice making can be explained behaviorally through RFT, it may be true that they too, can be addressed through the same explanation to treat such issues of impulsive choice making. According to RFT (Hayes et al., 2001), humans develop relations not only through experiencing contingencies of reinforcement, but also through relating functions of stimuli that transfer from one to another. The explanation that human beings are able to develop this complex learning is through the ability to construct verbal language. It is true that animals do not have the capability to develop complex emotional and psychiatric disorders such as depression, anxiety, addictions, and many more. In addition, humans are the only species known to commit suicide and this concept is difficult to explain through direct contingencies of reinforcement. Since organisms cannot contact the contingency of future, there must be some explanation of how this abstract behavior of before and after is derived (Hayes, 1992). To date, the self-control research has focused on delays of rewards through concurrent activities, but it may be necessary to explain and intervene through the underlying concept that verbal events play a major role in behaviors. When concurrent schedule choices through contingency reinforcement is not effective with complex behaviors such as those associated with depression and anxiety, it may be appropriate to introduce interventions developed from RFT.

As researchers and scientists continue to treat impulsive characteristics and impulse control disorders, it may be appropriate to evaluate and intervene with such "unwanted" behavior by examining the function of the behavior. In adults, many types of impulsive behaviors may begin as pleasurable, but the outcome is actually a result of escape (Rachlin, 2000). For example, the pathological gambler may gamble to escape from financial problems, the alcoholic may drink to avoid issues at home, and the smoker may smoke to avoid the physiological feeling associated with anxiety and stress.

Thus far, there have been effective self-control interventions applied to both animal and humans. In the form of translational research, RFT serves as an important model to alter choice making and self-control related behaviors. There is plenty of room for further research that not only examines the history of reinforcement, magnitude of reinforcers, and length of delay, but also other factors that may be involved in choice making, such as language. While stepping into applied research with children to increase self-controlled choice making, it is imperative to also evaluate whether certain self-control strategies are effective with individuals who have been diagnosed with addictive or impulse control disorders. If these strategies cannot be demonstrated in settings with these individuals, there must be a better proposition of further research in these areas.

It may be unethical to apply such interventions to date with populations who experience suffering related to their impulsive choice making such as debt from pathological gambling or poor relationships from substance abuse. It would be difficult to utilize standard self-control training procedures with such individuals because of the unethical considerations of intentionally delaying reinforcers and forcing contact of exposure with the less optimal choice that may be gambling, abusing drugs and alcohol, or self-harm, for example. Also, the value of reinforcers may be completely different from those used with animals and children. In standard self-control interventions, it is appropriate to use primary reinforcers such as edibles for meeting a delay requirement. This would be unacceptable with these individuals who make poor choices because 1) it would be unethical to deprive them of primary reinforcers, 2) they may require stronger reinforcers such as values (spending time with friends and family), and 3) it may be more appropriate to determine the function of the choice making rather than the delay or contact with reinforcement.

» EXPLORING ADDITIONAL BEHAVIORAL AVENUES

If it is appropriate to utilize a RFT approach with verbal humans to manipulate choice making abilities, it may be necessary to consider a more applied intervention for those who struggle with impulse control disorders. Under specific conditions, one can produce self-control in a variety of ways. Other than directly training an individual to contact the contingency to produce a delayed or self-controlled response, verbal behavior has influenced responses as well. The individual's verbal repertoire has shown to tolerate delays by simply adding a verbal component to the self-control training. In addition, since it may not be always socially acceptable and efficient for the individual to participate in a table-top task that alters choice making, a therapeutic approach may be appropriate. Acceptance & Commitment Therapy (ACT), a talk therapy stemming from a variety of therapies, but the main developments coming from a RFT behavioral explanation, utilizes metaphors throughout the therapy process to increase psychological flexibility. RFT explains that humans learn via relations of human language and cognition, then ACT is an intervention that addresses such problem behaviors that arise due to this process. If this is so, ACT would be a useful intervention to help individuals develop self-control because it focuses on what humans value (reinforcers), present moment awareness (mindful about making choices), and acting or not acting on those choices. The development and construction of ACT from RFT exists due to the relational frames within various contexts that individuals experience. The components have been supported by empirical research from behavioral therapies and theories (Luoma, Hayes, & Wilson, 2007). This account may serve as an additional intervention that could teach humans, with a complex verbal repertoire, to delay tolerations in choice making.

ACT has been used as treatment with many disorders such as depression, anxiety, body image issues, chronic pain, and comorbid conditions (Luoma et al., 2007). Rather than applying this intervention to a multitude of disorders in place of other treatments, it may be appropriate to evaluate how ACT is successful with particular classified disorders. More specifically, substance abuse disorders and impulse control disorders have more recently been evaluated with treatment of ACT in place of treatment as usual, or in combination with other treatments. It is important to examine how ACT can be a successful treatment protocol for addictions or disorders that are harmful due to individual choice making.

Petersen and Zettle (2009) evaluated an ACT treatment group and a group who received treatment as usual (ongoing 12 step program) with individuals who struggled with depression and a substance abuse disorder. In addition to the participants report to have less depression if they underwent the ACT group, they also spent less time in treatment because they reached a criterion to discharge quicker. Luoma, Kohlenberg, Hayes and Fletcher (2012) evaluated individuals who had substance abuse disorders and also targeted and treated shame involved with this disorder. Participants participated in a 6-hour ACT workshop or treatment as usual for the same amount of time. Although the experimenters targeted shame, results showed a significant decrease in substance at a 4-month follow-up as opposed to the treatment as usual group. Other studies with ACT and addictive behaviors have treated individuals who use marijuana (Twohig, Shoenberger, & Hayes, 2007) and also with opiate addicts (Hayes, Wilson, Gifford, Bissett, Piasecki, Batten, Byrd, & Gregg, 2004). Many of the research studies do have limitations in that it is difficult to measure the choices that the individuals make, whether it is choosing to engage in substance abuse or any other impulsive act related to their struggle.

There are six components of ACT and each component can contribute to the manipulation of choice making. The components, described visually to co-exist in the shape of a hexagon (called a hexaflex), all interact with one another and are based on the notion that individuals engage in experiential avoidance which leads them to undesirable behaviors. The components include cognitive diffusion, acceptance, contact with the present moment, observing the self, values, and committed action. With the interaction of the six core principles, individuals are able to develop psychological flexibility.

Acceptance is a major component of ACT and focuses on assisting the participant with accepting formal properties of behaviors that one engages in as well particular thoughts related to those behaviors. The focus on acceptance for individuals with impulse control issues is important because if one could experience accepting thoughts for what they are, then they may be able to make better choices that will occur by waiting for a more optimal choice. The thoughts may not even be related to their addiction or impulsive choice, but rather lead them to engage in unwanted behaviors in order to avoid those aversive thoughts or emotions. A second component, cognitive defusion, is the process of changing or altering literal meanings of verbal stimuli and thoughts to make them less believable. For example, someone who makes the impulsive choice to gamble may report the "need" to gamble. A technique may include describing what "need" really means and why the individual feels the need to gamble. Defusion strategies help to develop new contexts of thoughts for the clients, which in turn will diminish or alter the adverse, prior function related to the thought (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Experientially avoiding verbal stimuli related to unwanted choices may only reinforce the escape maintained behavior, resulting in avoidance of those words, and relations that will continue to be associated with the behaviors. By defusing the language, one will become more psychologically flexible. A third component, contact with the present moment awareness, includes teaching the client mindfulness techniques to use to create psychological flexibility. For the individual attempting to engage in self-control, rather than focusing on all of the those reinforcing contingencies that have increased choosing stimuli in the past, techniques involve teaching them to focus on what is occurring in the here and now (Hayes, Strosahl, & Wilson, 1999). For example, if the individual is focused on what is occurring around him, he is more likely to make a "mindful" choice, keeping in mind the consequences of each whether it be smaller, immediate choice or a longer, delayed choice. A fourth component, observing the self, is also known as self-context. Oftentimes, the individual who is struggling labels oneself with emotions, thoughts, or names such as "addict" based on their past actions or thoughts. The individual may become fused to particular thoughts that have occurred in the context of the impulsive choice making. A fifth component, values, plays a major role in choice making. Values refer to the long term reinforcers and preferences that people live by. Values are what motivate humans to make optimal choices. For example, values for the pathological gambler or substance abuser may include finishing school, succeeding at work, or building a family, and spending time with friends and family. Usually, the client is far from living a value driven life and may need to re-assess their values to increase awareness of making those more delayed, larger choices that follow their identified values. Committed action is a final component of ACT and it is an important factor to emphasize that our behavior can be separate from our thoughts and feelings. The individual who is making the less optimal choices may not be aware that their behaviors are showing that. In other words, their behaviors should reflect their desire to live a value driven life. For example, if the individual commits to staying home rather than going to the casino or to the bar to engage in unwanted behaviors, they are making the choice that coincides with the larger, delayed reinforcer. ACT has been widely used and has implications to be a successful intervention with self-control training in a more applied setting. At some point, there must be a push toward what will be effective with those who have sophisticated verbal repertoires and continue to struggle with impulsivity into their adult lives.

In conclusion, as much as there has been great progress in finding behavior analytic interventions and techniques to alter choice making, future research and treatment will greatly impact appropriate definitions of impulsivity and self-control. This is especially true if the goal is to alter choice making to become more optimal for the individual and for others around the individual. As research progresses, it may be safe to say that not only a history of reinforcement or contacting directly trained contingencies contribute to optimal choice making. Additional behavior analytic interventions may influence the tolerance to the delay such as interaction of delay, the magnitude of the reinforcer, conditioned reinforcement of the task, and the functions attached to the stimuli. ■

REFERENCES

Ainslie, G.W. (1974). Impulse control in pigeons. *Journal of the Experimental Analysis of Behavior, 21*, 485-489.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders,* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Baumeister, R.F. & Heatherton, T.F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7,* 1–15. doi: 10.1207/s15327965pli0701_1

Binder, L.M., Dixon, M.R., & Ghezzi, P.M. (2000). A procedure to teach self-control to children with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis, 33*, 233–237. doi: 10.1901/jaba.2000.33-233

Dixon, M.R., & Cummings, A. (2001). Self-control in children with autism: Response allocation during delays to reinforcement. *Journal of Applied Behavior Analysis, 34,* 491–495. doi: 10.1901/jaba.2001.34-491

Dixon, M.R., & Falcomata, T.S. (2004). Preference for progressive delays and concurrent physical therapy exercise in an adult with acquired brain injury. *Journal of Applied Behavior Analysis, 37*, 101–105. doi: 10.1901/jaba.2004.37-101

Dixon, M.R., & Holcomb, S. (2000). Teaching self-control to small groups of dually diagnosed adults. *Journal of Applied Behavior Analysis, 33*, 611–614. doi: 10.1901/jaba.2000.33-611

Dixon, M.R., & Holton, B. (2009). Altering the magnitude of delay discounting by pathological gamblers. *Journal of Applied Behavior Analysis, 42*, 269–275. doi: 10.1901/jaba.2009.42-269

Dixon, M.R., & Tibbetts, P.A. (2009). The effects of choice on self-control. *Journal of Applied Behavior Analysis, 42*, 243–252. doi: 10.1901/jaba.2009.42-243

Dougherty, D.M., Marsh, D.M., Mathias, C.W., & Swann, A.C. (2005). The conceptualization and role of impulsivity: Bipolar disorder and substance abuse. *Psychiatric Times, 22*, 32–35.

Dougherty, D.M., Mathias, C.W., Marsh-Richard, D.M., Furr, R.M., Nouvion, S.O., Dawes, M.A. (2009). Distinctions in behavioral impulsivity: Implications for substance abuse research. *Addiction Disorders & Their Treatment, 8*, 61–73. doi:10.1097/ADT.0b013e318172e488

Dougherty, D.M., Steinberg, J.L., Wassef, A.A., Medearis, D., Cherek D.R., & Moeller, F.G. (1998). Immediate versus delayed visual memory task performance among schizophrenic patients and normal control subjects. *Psychiatric Research, 79*, 255–265. doi:10.1016/S0165-1781(98)00040-7

Falcomata, T.S., & Dixon, M.R. (2004). Enhancing physical therapy exercises in persons with acquired brain injury through a self-control training procedure. *European Journal of Behavior Analysis, 29*, 29–41.

Ferster, C.B. (1953). Sustained behavior under delayed reinforcement. *Journal of Experimental Psychology, 45*, 218–224. doi: 10.1037/h0062158

Forzano, L.B., Michels, J.L., Carpella, R.K., Conway, P., & Chelonis, J.J. (2011). Self-control and impulsivity in children: Multiple behavioral measures. *The Psychological Record, 61*, 425–448.

Grosch, J., & Neuringer, A. (1981). Self-control in pigeons under the Mischel Paradigm. *Journal of the Experimental Analysis of Behavior, 35*, 3–21. doi: 10.1901/jeab.1981.35-3

Haye, S.C. (1992). Verbal relations, time, and suicide. In S.C. Hayes & L.J. Hayes (Eds.), *Understanding verbal relations* (pp. 109–118). Reno, NV: Context Press.

Hayes, S.C., Barnes-Holmes, D., Roche, B. (2001). *Relational frame theory: A post-skinnerian account of human language and cognition*. New York: Kluwer Academic/Plenum Publishers.

Hayes, S.C., Luoma, J.B., Bond, F.W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes, and outcomes. *Behaviour Research and Therapy*, 44, 1–25. doi:10.1016/j.brat.2005.06.006

Hayes, S.C., Strosahl, K., & Wilson, K.G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change.* New York: Guilford Press.

Hayes, S.C., & Wilson, K.G. (1993). Some applied implications of a contemporary behavior-analytic account of verbal events. *The Behavior Analyst, 16*, 283–301.

Hayes, S.C., Wilson, K.G., Gifford, E.V., Bissett, R., Piasecki, M., Batten, S.V., Byrd, M., & Gregg, J. (2004). A preliminary trial of twelve-step facilitation and acceptance and commitment therapy with polysubstance-abusing methadone-maintained opiate addicts. *Behavior Therapy, 35,* 667–688. doi: 005-7894/04/0667-0688

Hoerger, M.L. & Mace, C.F. (2006). A computerized test of self-control classroom behavior. *Journal of Applied Behavior Analysis, 39*, 147–159. doi: 10.1901/jaba.2006.171-04

Hoon, A., Dymond, S., Jackson, J.W., & Dixon, M.R. (2008). Contextual control of slot-machine gambling: Replication and extension. *Journal of Applied Behavior Analysis, 41*, 467–470. doi: 10.1901/jaba.2008.41-467

Hyten C., Madden G.J., Field D.P. (1994). Exchange delays and impulsive choices in adult humans. *Journal of the Experimental Analysis of Behavior, 62*, 225–233. doi: 10.1901/jeab.1994.62-225

Jackson, K., & Hackenberg, T.D. (1996). Token reinforcement, choice and self-control in pigeons. *Journal of the Experimental Analysis of Behavior, 66*, 29–49. doi: 10.1901/jeab.1996.66-29

Johnson, T.E. & Dixon, M.R. (2009). Influencing children's pregambling game playing via conditional discrimination training. *Journal of Applied Behavior Analysis, 42,* 73–81. doi: 10.1901/jaba.2009.42-73

Logan, G.D., Schachar, R.J., & Tannock, R. (1997). Impulsivity and inhibitory control. *Psychological Science, 8,* 60–64. doi:10.1111/j.1467-9280.1997.tb00545

Logue, A.W. (1996). Self-control: An alternative self regulation framework applicable to human and nonhuman behavior. *Psychological Inquiry*, 1–6. doi: 10.1207/s15327965pli0701_13

Logue, A.W. & Peña-Correal, T.E. (1984). Responding during reinforcement delay in a self-control paradigm. *Journal of the Experimental Analysis of Behavior, 4*, 267–277. doi:10.1901/jeab.1984.41-267

Logue, A.W., Pena-Correal, T.E., Rodriguez, M.L., & Kabela, E. (1986). Self-control in adult humans: variation in positive reinforcer amount and delay. *Journal of the Experimental Analysis of Behavior, 46*, 159–173. doi: 10.1901/jeab.1986.46-159

Luoma, J.B., Hayes, S.C., & Walser, R.D. (2007). Learning ACT: An Acceptance & Commitment Therapy Skills-Training Manual for Therapists. Oakland, CA: New Harbinger & Reno, NV: Context Press.

Luoma, J.B., Kohlenberg, B.S., Hayes, S.C., & Fletcher, L. (2012). Slow and steady wins the race: A randomized clinical trial of Acceptance & Commitment Therapy targeting shame in substance use disorders. *Journal of Consulting & Clinical Psychology, 80*, 43–53. doi: 10.1037/a0026070

Mischel, H.N., Ebbesen, E.B., & Zeiss, A.R. (1972). Cognitive and attentionalmechanisms in delay of gratification. *Journal of Personality and SocialPsychology, 16,* 204–218. doi: 10.1037/h0032198

Nastally, B. L., Dixon, M. R., & Jackson, J. W. (2010). Manipulating slot machinepreference in problem gamblers through contextual control. *Journal of Applied BehaviorAnalysis, 43*, 125–129. doi: 10.1901/jaba.2010.43-125

Neef, N. A., Bicard, D. F., & Endo, S. (2001). Assessment of impulsivity and thedevelopment of self-control in students with attention deficit hyperactivitydisorder. *Journal of Applied Behavior Analysis, 34*, 397–408. doi: 10.1901/jaba.2001.34-397

Neef, N. A., Bicard, D. F., Endo, S., Coury, D. L., & Aman, M. G. (2005). Evaluation of pharmacological treatment of impulsivity in children with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis, 38*, 135–146. doi: 10.1901/jaba.2005.116-02

Petersen, C. L. & Zettle, R. D. (2009). Treating inpatients with comorbid depression and alcohol use disorders: A comparison of acceptance and commitment therapy versus treatment as usual. *The Psychological Record, 59*, 521–536.

Rachlin, H. (1974). Commitment, choice, and self-control. *Journal of the Experimental Analysis of Behavior, 17*, 15–22. doi: 10.1901/jeab.1972.17-15

Rachlin, H. (2000). The Science of Self-Control. Cambridge, MA: Howard University Press.

Schweitzer, J. B., & Sulzer-Azaroff, B. (1988). Self-control: Teaching tolerance for delay in impulsive children. *Journal of the Experimental Analysis of Behavior, 50*, 173–186. doi: 10.1901/jeab.1988.50-173

Sonuga-Barke, E. J. S, Taylor, E., Sembi S., Smith J. (1992). Hyperactivity and delay aversion: The effects of delay on choice. *Journal of Child Psychology and Psychiatry, 33*, 387–398. doi: 10.1111/j.1469-7610.1992.tb00874.x

Vollmer, R. T., Borerro, J. C., Lalli, J. S., & Daniel, D. (1999). Evaluating self-control and impulsivity in children with severe behavior disorders. *Journal of Applied Behavior Analysis, 32*, 451–466. doi: 10.1901/jaba.1999.32-451

Zlomke, K. R., & Dixon, M. R. (2006). Modification of slot-machine preferencesthrough the useof a conditional discrimination paradigm. *Journal of Applied Behavior Analysis, 39*, 351-361. doi: 10.1901/jaba.2006.109-04