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Furthering a behavior analytic account of self-control using relational frame theory

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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

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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. ■

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