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Children's Answering of Yes-No Questions: A Review of Research Including Particular Consideration of the Relational Evaluation Procedure

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Answering yes/no questions (Y/N-Q responding) is a fundamental repertoire in human language and thus it is of both theoretical and practical importance to investigate the origins and development of this repertoire in children and to examine processes whereby it can be trained in populations in whom it does not easily emerge. This article examines research and theory concerning the development and training of Y/N-Q responding in children. Regarding research with neurotypical children, 1 key focus has been biases in Y/N-Q responding at various ages. Younger children tend to show a yes bias, whereas older ones show a bias toward no. Regarding children with developmental delay, there has been relatively little research, almost all of which has focused on children with autism spectrum disorder. In addition, this work has mainly concentrated on using yes/no in the context of the training of Skinnerian operants. After thus considering previous empirical work, the article proceeds to consider theoretical approaches in this area including both joint stimulus control and relational frame theory. These approaches point the way to possible future research in this area.

Keywords: yes/no responding, children, autism spectrum disorder (ASD), relational frame theory (RFT), relational evaluation procedure

The ability to answer yes/no questions (Y/N-Qs) is a basic but fundamental language repertoire that plays a pivotal role in social interactions (e.g., Raymond, 2003). The significance of responding to Y/N-Qs is illustrated by the fact that some adaptation of them has developed in almost every known language system (Sadock & Zwicky, 1985). Responding to Y/N-Qs occurs in an extensive array of circumstances to accomplish a multiplicity of pursuits across age groups (e.g., Aldridge & Wood, 1998; Race, Ochfeld, Leigh, & Hillis, 2012; Schindler, Kissler, Kühl, Hellweg, & Bengner, 2013; Soderstrom, Ko, & Nevzorova, 2011). One area where they seem to be of particular use, however, is when adults are communicating with children. For example, Y/N-Qs are the principal tactics used to elicit information in medical situations, where doctors are required to obtain information from children in relation to ill health (e.g., Von Baeyer, Forsyth, Stanford, Watson, & Chambers, 2009), in educational settings, where teachers occasion responses from students (e.g., Edwards & Mercer, 1986), and in eyewitness and forensic settings, where children are interviewed in relation to a crime (e.g., Krahenbuhl & Blades, 2006). For example, Davies, Westcott, and Horan (2000) analyzed transcripts of investigative interviews conducted by police officers in the United Kingdom. They found that 40% of all the questions posed to 4- to 7-year-olds were closed questions (e.g., Y/N-Qs). Furthermore, in the developmental literature, researchers regularly use Y/N-Qs to test children's cognitive and social development (Fritzley & Lee, 2003).

Given the importance of Y/N-Q responding as a fundamental repertoire in human language and in particular the extent to which adults use this repertoire as a means of communicating with children, it is of both theoretical and practical importance to investigate the origins and development of this repertoire in children and to

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examine processes whereby it can be trained in populations in whom it does not easily emerge. The aim of this article is to review mainstream and behavior analytic research on Y/N-Q responding in children and to examine possible future research directions for this work for behavior analysis in particular.

Y/N-Qs in the Cognitive Developmental Literature

Research suggests that by 17 months of age, young children can discriminate yes/no questions and will tend to respond to them even though they are unlikely to understand the content of the question. By about 24 months of age they begin to be able to reliably respond to semantic content of Y/N-Qs also as indicated by increasing numbers of correct answers. However even at this age they are still dependent on the presence of concrete lexical items to answer correctly (Choi, 1991).

Discrepancies exist in the literature regarding children's response tendencies toward Y/N-Qs across age, condition, question type, and cultural background. One well-replicated finding, however, is that children aged between 24 and 36 months tend to show biases of various kinds when answering Y/N-Qs and in particular children closer to 24 than 36 months tend to display a yes bias (e.g., Fritzley, Lindsay, & Lee, 2013; Okanda & Itakura, 2010; Von Baeyer et al., 2009; Moriguchi, Okanda, & Itakura, 2008).

For example, Fritzley et al. (2013) investigated response tendencies of preschoolers toward Y/N-Qs about actions. Two hundred children aged 2–5 years old were asked questions concerning actions commonly associated with particular objects (e.g., "Did I drink from the cup?") and actions not commonly associated with particular objects (e.g., "Did I sit on the apple?"). The researchers found that the younger children (i.e., those approximately 2 years old) displayed a yes bias. This same bias has also been found in previous studies involving Y/N-Qs about objects (e.g., Fritzley & Lee, 2003). In addition, evidence suggests that it is unrelated to culture, interviewer status, or question type. For example, 2-year-olds have been found to show a yes bias to comprehensible yes–no questions pertaining to both familiar and unfamiliar objects (e.g., Fritzley, Lindsay, & Lee, 2013; Fritzley & Lee, 2003; Okanda et al., 2012; Okanda & Itakura, 2008) in research conducted throughout the world including North America, Europe, and Asia.

Some work has been conducted to examine possible correlates of yes bias responding in young children. For example, Moriguchi et al. (2008) found that 3- and 4-year-olds' response bias scores on a yes bias task were significantly negatively correlated with performance on a dimensional change card sort task and a picture vocabulary test. On the basis of evidence such as this, Okanda and Itakura (2010) have proposed that very young children might exhibit a yes bias due to underdevelopment of either verbal or inhibitory control abilities respectively. Further research is needed however.

The results for 3-year old children are more varied than for 2-year-olds; however research from a variety of countries including Canada, the U.S., Japan, Vietnam and Hungary has shown that 3-year-olds will still exhibit a yes bias under at least some conditions (Fritzley et al., 2013; Fritzley & Lee, 2003; Okanda & Itakura, 2007, 2008, 2010; Okanda & Itakura, 2011; Okanda, Kanda, Ishiguro, & Itakura, 2013). In further investigations, Okanda and Itakura (2011) found that 3-year-olds both tended to be incorrect more frequently than 6 year olds in their answering of Y/N-Qs pertaining to both familiar and unfamiliar objects, while also showing significantly shorter response latencies.

Unlike the consistent results from younger preschoolers, there were cross-conditional and cross-cultural differences in older preschoolers' response tendencies to Y/N-Qs. Fritzley and Lee (2003) reported that North American 4- and 5-year-olds did not exhibit a response bias to comprehensible questions but exhibited a nay-saying bias to incomprehensible questions pertaining to familiar and unfamiliar objects. Japanese and Vietnamese 5-year-olds (Okanda & Itakura, 2008) and Hungarian 4- and 5-year-olds (Okanda et al., 2012) have been found to exhibit a nay-saying bias to comprehensible questions pertaining to unfamiliar objects. However, Japanese and Vietnamese 4-year-olds exhibited a yes bias when they were asked comprehensible questions pertaining to familiar objects (Okanda & Itakura, 2008, 2011), and unfamiliar objects (Okanda & Itakura, 2010). A yes bias was found in Japanese 5- and 6-year-olds in relation to familiar objects, but it was

significantly weaker than the bias exhibited by 3-year-olds (Okanda & Itakura, 2010; Okanda & Itakura, 2011). Okanda and Itakura (2010) and Okanda and Itakura (2011) reported that 6-year-olds across cultures tended to exhibit a nay-saying bias to questions pertaining to facial expressions and for unfamiliar object conditions.

Y/N-Qs in Children With Developmental Delay

There has been little research into the response to Y/N-Qs among children with developmental delay and all of the work thus far has been focused on children with autism spectrum disorder (ASD). Neurotypical children develop the ability to respond to Y/N-Qs through exposure to the natural learning environment, although it is evident from the above that additional teaching is still required. Meantime, research suggests that children with ASD need additional support in learning to respond to Y/N-Qs questions as well as in generalizing these responses to novel contexts. Leaf and McEachin (1999) highlight the importance of training yes/no responding in children with ASD. They argue that ability to answer Y/N-Qs provides a means for communicating preferences, establishes choice making and promotes assertiveness. In addition, teaching communicative rejecting provides the child with a socially acceptable strategy to escape and avoid nonpreferred objects and activities which may prevent/reduce problem behavior (Sigafoos, Arthur, & O'Reilly, 2003).

Many of the studies conducted with this group have provided limited information (e.g., specific diagnostic category) concerning the participants involved. Nevertheless, some potentially informative patterns have been identified. For example, the more complex the Y/N-Q and the more unfamiliar the vocabulary or topic, the more likely that echolalia will occur instead of a yes or no response (Charlop, 1986; Roberts, 1989; Rydell & Mirenda, 1994). In addition, Oi and colleagues examined the ability of high functioning ASD children in relation to Y/N-Qs and found (a) that they could clearly answer simple Y/N-Qs by age 7, whereas lower-functioning ASD children could not; (b) that they were better able to answer Y/N-Q than "wh" questions; and (c) that they had more difficulty answering Y/N-Qs than their typically developing counterparts (Oi, 2010; Funazaki & Oi, 2013).

Given the necessity of supporting children with ASD in their learning of appropriate responding to Y/N-Qs, a certain amount of research has been conducted toward this end. Some relevant early literature focused on Y/N-Q responding centered on desires and refusals. For example, Hung (1980) described procedures to teach requesting and rejecting to two children with ASD. The participants were taught to produce a vocal verbal yes when offered ("Do you want?") preferred food items, and to say no when offered nonpreferred food items. More recently, similar procedures with adults with severe to profound intellectual disabilities (Duker & Jutten, 1997) were reported. However, in the latter the researchers additionally probed for generalization across settings and found that the skills did not readily transfer. This is a significant limitation as generalization is pivotal to the success of any individualized educational program.

Neef, Walters, and Egel (1984) examined the training and generalization of yes and no responses from mand to tact conditions. Four children who exhibited autistic-like behavior were recorded during tutoring (i.e., tact condition; "Is this a —?") and embedded instruction (i.e., mand condition; "Do you want a —?"). Results indicated that the participants acquired appropriate Y/N-Q responding during the mand training condition. However generalized responding to novel stimuli under the tact condition was not observed without the continued use of mand-to-tact stimulus control transfer procedures.

In a more recent investigation, Shillingsburg, Kelley, Roane, Kisamore, and Brown (2009) used an echoic prompt and prompt fade sequence to teach three students with ASD to emit Y/N-Q responding to mands, tacts, and intraverbals. Using a multiple baseline across behaviors, participants demonstrated generalized responding within the same operant class (i.e., to novel or untrained tact stimuli following training with one tact stimulus), but none demonstrated generalized responding across operant classes (i.e., to novel or untrained tact stimuli following training with one mand stimulus). In addition, although generalized Y/N-Q responding to untrained stimuli within the tact condition

had been observed, no analysis was provided to account for how this had occurred.

Theories of Y/N-Q Responding

Despite the apparent importance of acquiring a repertoire of Y/N-Q responding, it appears that there has been relatively little empirical behavior analytic work conducted in this domain. Recently however this has begun to change. In this section we will consider two theoretical approaches to explaining generative language that provide explanations of the emergence of Y/N-Q responding and that have inspired empirical research in this area. One is joint stimulus control (Lowenkron, 1998) and the other is relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001).

Joint Stimulus Control

Joint stimulus control (JSC) has been defined as "a discrete event, a change in stimulus control that occurs when a response topography evoked by one stimulus . . . and preserved by rehearsal, is emitted under the additional (and thus joint) control of a second stimulus" (Lowenkron, 1998, p. 332). For example, imagine that a student is asked to retrieve blue paint. Immediately after the instruction, he echoes it ("blue paint). As he looks for the item requested, he continues by self-echoing the name of the object. Then when he sees the blue paint, the sight of it evokes saying "blue paint" as a tact, and the topography of this response matches that of the self-echoic. The joint occurrence of these two controlling stimuli then evokes a correct selection response (i.e., picking up the blue paint). Lowenkron (1998) argued that JSC may be used to explain a variety of novel or generative performances, including, for example, derived naming and equivalence. Furthermore, an increasing quantity of research has emerged to support this account in recent years (e.g., Lowenkron, 1998, 2006; Tu, 2006; Esch, Esch, McCart, & Petursdottir, 2010).

Carbone (2015) has used this account to explain the learning of Y/N-Q responding in particular. For example, in one unpublished study, he trained a 14-year-old male with a diagnosis of PDD-NOS to vocally emit "yes" or "no" in response to questions about stimulus objects that he could reliably tact. For example, when shown a pencil and asked "Is this a pencil?" he would have to say yes, whereas when shown a pencil and asked "Is this a drum?" he would have to say no. The training stimuli were presented in a randomized order from all stimuli that were not acquired during earlier baseline probes. Once a trained stimulus was acquired, probes of untrained stimuli were conducted to assess responding to novel stimuli and questions. The results showed a consistent increasing trend in the rate of acquisition of untrained stimuli. A pattern such as this suggests that responding was brought under sources of stimulus control that were common to all trials. Carbone argued that the key process responsible was JSC. More specifically, he argued that saying yes was brought under control of tacting the presence of JSC while saying no was brought under control of tacting the absence of JSC (see Figure 1).

Thus JSC provides one possible means of explaining the acquisition across exemplars of a generalized Y/N-Q repertoire. It has been suggested that the process of JSC comes to determine correct responding in this and other cases of complex human responding because the controlling relationship between JSC and appropriate responding is incidentally reinforced across exemplars (Lowenkron, 1998). Another recent theory that also explains the acquisition of complex human responding including Y/N-Q in terms of multiple exemplars is RFT.

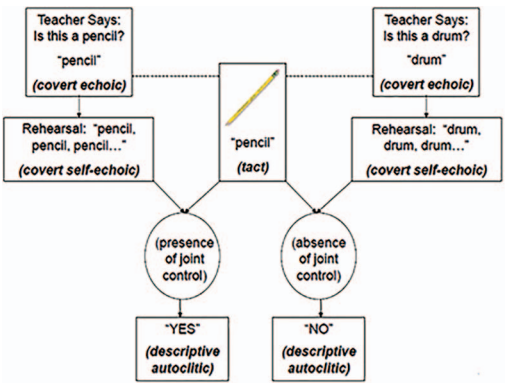

Figure 1. Analysis of the joint control process with yes/no questions.

RFT

RFT (e.g., Hayes, Barnes-Holmes, & Roche, 2001) explains human language including Y/N-Q as arbitrarily applicable relational responding or relational framing. In explaining this concept, relational frame theorists typically start by introducing the related but simpler concept of nonarbitrary relational responding which involves relating events under the control of the physical properties of those events (Dymond & Whelan, 2010); an example is selecting an object that is bigger than or smaller than another object. Arbitrarily applicable relational responding, in contrast, involves relating not under the control of the physical properties of the related objects but instead under the control of one or more contextual cues. For example, if I tell a child that X is more than Y then they may derive that Y is less than X. They do not derive this new relation based on physical properties of these stimuli but instead based on the contextual cues "more" and "less," which have been established to function as such via multiple exemplars of exposure to these cues over time.

RFT suggests that many different varieties of such arbitrarily applicable relational responding or relational framing are learned in this way including, for example, sameness (e.g., "Bingo is a dog"), difference (e.g., "This is not an apple"), comparison (e.g., "A quarter is bigger than a dime"), opposition (e.g., "Black is the opposite of white"), and temporality (e.g., "Spring comes before summer") among others. Furthermore, RFT researchers have provided by now substantial evidence that relational framing in its multiple forms may indeed be the key operant underlying the flexibility, generativity and scope of human language and complex behavior more generally (see Dymond & Roche, 2013). For example, there is now considerable evidence showing that relational framing emerges and develops over time both in terms of its complexity and variety (e.g., Berens & Hayes, 2007); that the ability to do relational framing is not simply correlated with language but begins to emerge before the development of an advanced language repertoire (e.g., Luciano, Gómez Becerra, Rodríguez Valverde, 2007); that relational framing meets key criteria for being an operant (e.g., Healy, Barnes-Holmes, & Smeets, 2000); that training relational framing can boost verbal and intellectual ability in both typically developing children (e.g., Cassidy, Roche, & Hayes, 2011) and children with developmental delay (e.g., Murphy & Barnes-Holmes, 2009a, 2009b, 2010a, 2010b); and that relational framing as a concept can be used very effectively as an analytic unit for investigating human language and cognition (see Dymond & Roche, 2013, for a recent book length review).

From an RFT perspective, Y/N-Q is an important repertoire that children learn as they learn to relationally frame and that helps to support their learning of an increasingly complex set of relations and an increasingly extensive relational network. More specifically, the response options yes and no can be seen as indicating or referring to relational coherence. *Relational coherence* or *coherent relational responding* is defined as relating in a manner that is consistent with what was previously learned within a particular socioverbal community (Hughes & Barnes-Holmes, 2016). For example, the socioverbal community with which the current authors and readers are familiar reinforces relational responding in accordance with the following pattern of comparative relations: If A is more than B and B is more than C then A is more than C. If someone trained within this community is given a particular set of relations of the first two-types (e.g., "A ZID is more than a YIM" and "A YIM is more than a DAX") and subsequently emits a relational response that does not conform with the taught pattern (e.g., "A ZID is less than a DAX") then we might describe this response as incoherent. Yes and No are response options that a person is taught as a means of referring to or indicating the coherence or otherwise of particular relational networks. For example, imagine that someone has previously learned or derived that "a ZID is more than a DAX." If I then ask them whether a ZID is more than a DAX they can indicate that this coheres with their previously acquired relational network by responding yes; whereas if I ask them whether a DAX is more than a ZID then they can indicate lack of coherence by responding no. In accordance with this analysis, yes and no have been called *relational coherence indicators* (RCI; e.g., Maloney & Barnes-Holmes, 2016). Children learn to emit and respond to the RCIs of yes and no via multiple exemplar training provided by the socioverbal

community. This training establishes yes as equivalent to coherent networks and no to incoherent networks and occurs in conjunction with an increasingly complex relational repertoire involving an expanding set of relations and an increasingly extensive relational network. For example, in early childhood the types of relational network about which a child might be asked yes/no questions will often be relatively simple and may involve directly perceptible relations (e.g., "Is the cat on the mat?", "Is the sky green?") whereas as they get older they will ask and answer yes/no questions with respect to increasingly complex relational networks (e.g., "Is oxygen a compound?," "Are you an outgoing person?," "Does it look like Team X can beat Team Y?"). As such, yes and no are used in an increasingly varied set of contexts. Given their extensive use and the variation of the contexts in which they are used, they thus become increasingly generalized.

Although yes and no are important verbal phenomena, there is little published RFT research as yet into Y/N-Q per se (though see O'Connor, 2004). At the same time, however, Y/N-Q responding has been incorporated into RFT research in an important way, in the context of the Relational Evaluation Procedure (REP; see Barnes-Holmes, Hayes, Dymond, & O'Hora, 2001; Hayes, Stewart, & McElwee, 2016; Stewart, Barnes-Holmes, & Roche, 2004). The REP is a methodology developed by RFT researchers as a means of assessing and training relational framing under controlled laboratory conditions. The core feature of the REP is that it allows experimental participants to evaluate, or report on, the stimulus relation or relations that are presented on a given trial (see Figure 2 for a simple example). In the typical approach, participants may confirm or deny the applicability of particular stimulus relations to other sets of stimulus relations (e.g., Stewart et al., 2004). As an example of a typical REP type study, in Stewart et al. (2004) pretraining first established particular relational functions (i.e., same and different) in arbitrary stimuli as well as establishing the functions of yes and no in two further arbitrary stimuli. Then during an assessment phase, stimuli in a particular relation with each other (e.g., two same- or differently colored objects), a contextual cue (e.g., one of the two arbitrary shapes established as same and different), and the cues for yes and no were presented. As predicted, participants chose the yes comparison when the contextual cue correctly corresponded to the relationship between the colored objects (e.g., same color or different color) and chose the no comparison when it did not. Once the functions of the contextual cues were established, it was possible for a potentially infinite number of relational responses to be observed (Stewart et al., 2004).

Figure 2. Example of a typical relational evaluation procedure trial-type.

The REP as used in Stewart et al. (2004) and similar studies has arguably enabled researchers to explore patterns of relational framing in humans much more effectively than older methodologies such as the matching-to-sample protocol could. In addition, more recently, it has also inspired the development of further protocols offering further particular advantages for assessing and training relational framing in particular contexts and indeed, much of this work has used children as participants.

For example, one such protocol is the SMART (Strengthening Mental Abilities with Relational Training) online protocol (Cassidy, Roche, & Hayes, 2011; Cassidy, Roche, Colbert, Stewart, & Grey, 2016; Hayes & Stewart, 2016). The SMART is essentially a systematically organized set of REP trials focused on the thoroughgoing assessment and training of core forms of relational framing. An early prototype of this online method was used by Cassidy, Roche, and Hayes (2011) to train both educationally typical and educationally disadvantaged children in core patterns of relational framing. The basic format involves the presentation of a relational network and a question as to the nature of the relation between two members of that network that could be answered by pressing either yes or no at the bottom of the screen. Results showed that months-long training at increasing levels of complexity in a number of frames including same, opposite, more

and less resulted in substantial WISC IQ gains in both educationally typical (Study 1) and educationally disadvantaged children (Study 2).

Another concept inspired by the REP is the Implicit Relational Assessment Protocol (IRAP), which has now become extremely useful and popular in the exploration of participants' verbal repertoires (Barnes-Holmes, Barnes-Holmes, Power, Hayden, Milne, & Stewart, 2006; Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2010). The IRAP requires participants to respond quickly and accurately via RCI stimuli such as yes/no or true/false to networks of relations. IRAP research has typically been focused on exploring attitudes (e.g., to race) in typically developed adult humans. However it has also been used in work focused on other phenomena such as cognitive ability and has involved participants both younger and older than this. One recent domain of research, for example, has begun to focus on IRAP testing and training in typically developing children as well as children with educational and behvioral difficulties (e.g., Kilroe, Murphy, Barnes-Holmes & Barnes-Holmes, 2014; Scanlon, McEnteggart, Barnes-Holmes, Barnes-Holmes,& Stewart 2014). For example, Kilroe et al. (2014) used the IRAP to explore relational responding in children with autism, while Scanlon et al. (2014) used it to explore gender bias and self-esteem in typically developing children as well as children with ADHD and dylexia. This is as much as RFT research has done with respect to Y/N-Q so far. Despite the utility of these protocols though they are not focused on the development of Y/N-Q responding per se. They take advantage of this repertoire but have not directly facilitated the exploration of the development of Y/N-Q responding themselves. This is one potentially important direction for future RFT research. Researchers need to explore the typical emergence of Y/N-Q responding and to develop effective means of training this repertoire where needed.

Recommendations for Future Research in Y/N-Q Responding

As explained near the start of this article, responding to Y/N-Qs occurs in a wide variety of contexts to accomplish an extensive array of activities. In addition to being the primary method of eliciting information from children across daily pursuits, Y/N-Qs are also the primary data collection method for young children within the developmental literature. In addition, a substantial amount of research has been carried out on response biases to Y/N-Qs. At the same time, however, relatively little research attention has been given to studying the development of Y/N-Q responding from a functional analytic perspective with a view to using insights gained from such work to learn how best to train young children (whether neurotypical or otherwise) to respond to Y/N-Qs appropriately, so as to facilitate the use of Y/N-Qs in either traditional or more recent (e.g., RFT-based) protocols.

In this article, we have studied two approaches within behavior analysis, RFT and JSC, which might be useful for this purpose. Both approaches see the development of Y/N-Q responding as being based on multiple exemplars over time. Future work needs to study the development of Y/N-Q responding drawing on suggestions from both approaches. For example, JSC might suggest studying the extent to which children of different ages, both typically developing and otherwise, naturally engage in self-echoics in the learning of Y/N-Q responding as well as whether being supported in the use of self-echoics might accelerate development of this repertoire. RFT research might investigate the relationship between the development of framing and the development of a repertoire of Y/N-Q as one particularly important and prevalent form of RCI responding that likely develops in tandem with framing and helps support it. Determining normative rates of development of Y/N-Q responding in the context of the development of relational framing might allow researchers to create an assessment protocol that could help determine the best time at which to intervene to establish or strengthen a Y/N-Q repertoire as well as to use such a repertoire to train increasingly complex relational framing. Such research could work to optimize the use of MET to establish a Y/N-Q repertoire, as well as explore the use of Y/N-Q -based protocols such as the REP for assessing and training various forms of nonarbitrary and arbitrary relational responding in very young children.

Apart from exploring the initial establishment of a Y/N-Q repertoire, and using early Y/N-Q repertoires to train other relational rep-

ertoires, researchers might also investigate deficits in already established Y/N-Q responding and examine how they might be remediated. As discussed, bias in responding to Y/N-Qs is evident across young (i.e., 2–6 years) children's responses. One potentially important domain therefore, is the effect on such bias of training Y/N-Q responding in young children. As suggested earlier, Y/N-Qs are used very frequently with young children across a variety of domains, including developmental research. As such, it might seem important to be able to effectively assess and remediate deficits in Y/N-Q responding at as young an age as possible.

References

Aldridge, M., & Wood, J. (1998). *Interviewing children: A Guide for child care and forensic practitioners*. Chichester, England: Wiley.

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 (IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist, 32,* 169–177.

Barnes-Holmes, D., Barnes-Holmes, Y., Stewart, I., & Bowles, S. (2010). A sketch of the implicit relational assessment procedure (IRAP) and the relational elaboration and coherence (REC) model. *The Psychological Record, 60,* 527–542.

Barnes-Holmes, D., Hayes, S. C., Dymond, S., & O'Hora, D. (2001). Multiple stimulus relations and the transformation of stimulus functions. In S. C. Hayes, D. Barnes-Holmes, & B. T. Roche (Eds.), *Relational frame theory: A post-Skinnerian account of human language and cognition* (pp. 51–72). New York, NY: Plenum Press.

Berens, N. M., & Hayes, S. C. (2007). Arbitrarily applicable comparative relations: Experimental evidence for a relational operant. *Journal of Applied Behavior Analysis, 40,* 45–71. http://dx.doi.org/10.1901/jaba.2007.7-06

Carbone, V. (2015, April). *Advanced topics in behavior analysis & the treatment of children with autism* (pp. 55–66). Paper presented at the meeting of the Kentucky Association for Behaviour Analysis, Louisville, Kentucky.

Cassidy, S., Roche, B., Colbert, D., Stewart, I., & Grey, I. (2016). A relational frame skills training intervention to increase general intelligence and scholastic aptitude. *Learning and Individual Differences, 47,* 222–235. http://dx.doi.org/10.1016/j.lindif.2016.03.001

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.

Charlop, M. H. (1986). Setting effects on the occurrence of autistic children's immediate echolalia. *Journal of Autism and Developmental Disorders, 16,* 473–483. http://dx.doi.org/10.1007/BF01531712

Choi, S. (1991). Children's answers to yes-no questions A developmental study in English, French, and Korean. *Developmental Psychology, 27,* 407–420. http://dx.doi.org/10.1037/0012-1649.27.3.407

Davies, G. M., Westcott, H. L., & Horan, N. (2000). The impact of questioning style on the content of investigative interviews with suspected child abuse victims. *Psychology, Crime & Law, 6,* 81–97. http://dx.doi.org/10.1080/10683160008410834

Duker, P. C., & Jutten, W. (1997). Establishing gestural yes-no responding with individuals with profound mental retardation. *Education and Training in Mental Retardation and Developmental Disabilities, 32,* 59–67.

Dymond, S., & Roche, B. (Eds.). (2013). *Advances in relational frame theory: Research & application*. Oakland, CA: New Harbinger.

Dymond, S., & Whelan, R. (2010). Derived relational responding: A comparison of match-to-sample and the relational completion procedure. *Journal of the Experimental Analysis of Behavior, 94,* 37–55. http://dx.doi.org/10.1901/jeab.2010.94-37

Edwards, D., & Mercer, N. M. (1986). Context and continuity: Classroom discourse and the development of shared knowledge. In K. Durkin (Ed.), *Language development in the school years*. London, UK: Croom Helm.

Esch, J. W., Esch, B. E., McCart, J. D., & Petursdottir, A. I. (2010). An assessment of self-echoic behavior in young children. *Analysis of Verbal Behavior, 26,* 3–13.

Fritzley, V. H., & Lee, K. (2003). Do young children always say yes to yes-no questions? A metadevelopmental study of the affirmation bias. *Child Development, 74,* 1297–1313. http://dx.doi.org/10.1111/1467-8624.00608

Fritzley, H. V., Lindsay, R. C., & Lee, K. (2013). Young children's response tendencies toward yes-no questions concerning actions. *Child Development, 84,* 711–725. http://dx.doi.org/10.1111/cdev.12006

Funazaki, Y., & Oi, M. (2013). Factors affecting responses of children with autism spectrum disorder to yes/no questions. *Child Language Teaching and Therapy, 29,* 245–259. http://dx.doi.org/10.1177/0265659012464879

Hayes, J., & Stewart, I. (2016). Comparing the effects of derived relational training and computer coding on intellectual potential in school-age chil-

dren. *British Journal of Educational Psychology, 86,* 397–411. http://dx.doi.org/10.1111/bjep.12114

Hayes, J., Stewart, I., & McElwee, J. (2016). Assessing and training young children in same and different relations using the relational evaluation procedure (REP). *The Psychological Record*. Advance online publication. http://dx.doi.org/10.1007/s40732-016-0191-2

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

Healy, O., Barnes-Holmes, D., & Smeets, P. M. (2000). Derived relational responding as generalized operant behavior. *Journal of the Experimental Analysis of Behavior, 74,* 207–227. http://dx.doi.org/10.1901/jeab.2000.74-207

Hughes, S., & Barnes-Holmes, D. (2016). Relational Frame Theory: The basic account. In R. D. Zettle, S. C. Hayes, D. Barnes-Holmes, & A. Biglan (Eds.), *The wiley handbook of contextual behavioral science* (pp. 129–178). West Sussex, UK: Wiley-Blackwell.

Hung, D. W. (1980). Training and generalization of yes and no as mands in two autistic children. *Journal of Autism and Developmental Disorders, 10,* 139–152. http://dx.doi.org/10.1007/BF02408465

Kilroe, H., Murphy, C., Barnes-Holmes, D., & Barnes-Holmes, Y. (2014). Using the T-IRAP interactive computer programme and applied behaviour analysis to teach relational responding in children with autism. *Behavioral Development Bulletin, 19,* 60–81. http://dx.doi.org/10.1037/h0100578

Krähenbühl, S., & Blades, M. (2006). The effect of question repetition within interviews on young children's eyewitness recall. *Journal of Experimental Child Psychology, 94,* 57–67. http://dx.doi.org/10.1016/j.jecp.2005.12.002

Leaf, R., & McEachin, J. (1999). *A work in progress: Behavior management strategies and a curriculum for intensive behavioral treatment of autism*. New York, NY: DRL Books.

Lowenkron, B. (1998). Some logical functions of joint control. *Journal of the Experimental Analysis of Behavior, 69,* 327–354. http://dx.doi.org/10.1901/jeab.1998.69-327

Lowenkron, B. (2006a). An introduction to joint control. *Analysis of Verbal Behavior, 22,* 123–127.

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 the Experimental Analysis of Behavior, 87,* 349–365. http://dx.doi.org/10.1901/jeab.2007.08-06

Maloney, E., & Barnes-Holmes, D. (2016). Exploring the behavioral dynamics of the implicit relational assessment procedure: The role of relational contextual cues versus relational coherence indicators as response options. *The Psychological Record, 66,* 395–403. http://dx.doi.org/10.1007/s40732-016-0180-5

Moriguchi, Y., Okanda, M., & Itakura, S. (2008). Young children's yes bias: How does it relate to verbal ability, inhibitory control, and theory of mind? *First Language, 28,* 431–442. http://dx.doi.org/10.1177/0142723708092413

Murphy, C., & Barnes-Holmes, D. (2009a). Establishing derived manding for specific amounts with three children: An attempt at synthesizing Skinner's verbal behavior with relational frame theory. *The Psychological Record, 59,* 75–92.

Murphy, C., & Barnes-Holmes, D. (2009b). Derived more-less relational mands in children diagnosed with autism. *Journal of Applied Behavior Analysis, 42,* 253–268. http://dx.doi.org/10.1901/jaba.2009.42-253

Murphy, C., & Barnes-Holmes, D. (2010a). Establishing five derived mands in three adolescent boys with autism. *Journal of Applied Behavior Analysis, 43,* 537–541. http://dx.doi.org/10.1901/jaba.2010.43-537

Murphy, C., & Barnes-Holmes, D. (2010b). Establishing complex derived manding with children with and without a diagnosis of autism. *The Psychological Record, 60,* 489–504.

Neef, N. A., Walters, J., & Egel, A. L. (1984). Establishing generative yes/no responses in developmentally disabled children. *Journal of Applied Behavior Analysis, 17,* 453–460. http://dx.doi.org/10.1901/jaba.1984.17-453

O'Connor, J. (2004). *Designing procedures to establish repertoires of derived relational responding in normally-developing and autistic children* (Unpublished doctoral thesis). Maynooth University, Maynooth, Ireland.

Oi, M. (2010). Do Japanese children with high-functioning autism spectrum disorder respond differently to wh-questions and yes/no-questions? *Clinical Linguistics & Phonetics, 24,* 691–705. http://dx.doi.org/10.3109/02699206.2010.488313

Okanda, M., & Itakura, S. (2007). Do Japanese children say "yes" to their mothers? A naturalistic study of response bias in parent-toddler conversations. *First Language, 27,* 421–429. http://dx.doi.org/10.1177/0142723707081653

Okanda, M., & Itakura, S. (2008). One-month-old infants' sensitivity to social contingency from mothers and strangers: A pilot study. *Psychological Reports, 102,* 293–298. http://dx.doi.org/10.2466/pr0.102.1.293-298

Okanda, M., & Itakura, S. (2010). Do bilingual children exhibit a yes bias to yes-no questions?: Relationship between children's yes bias and verbal

ability. *The International Journal of Bilingualism, 16,* 1–9.

Okanda, M., & Itakura, S. (2011). Do young and old preschoolers exhibit response bias due to different mechanisms? Investigating children's response time. *Journal of Experimental Child Psychology, 110,* 453–460.

Okanda, M., Kanda, T., Ishiguro, H., & Itakura, S. (2013). Three- and 4-year-old children's response tendencies to various interviewers. *Journal of Experimental Child Psychology, 116,* 68–77. http://dx.doi.org/10.1016/j.jecp.2013.03.012

Okanda, M., Somogyi, E., & Itakura, S. (2012). Differences in response bias among younger and older reschoolers: Investigating Japanese and Hungarian preschoolers. *Journal of Cross-Cultural Psychology, 43,* 1325–1338. http://dx.doi.org/10.1177/0022022112440145

Race, D. S., Ochfeld, E., Leigh, R., & Hillis, A. E. (2012). Lesion analysis of cortical regions associated with the comprehension of nonreversible and reversible yes/no questions. *Neuropsychologia, 50,* 1946–1953. http://dx.doi.org/10.1016/j.neuropsychologia.2012.04.019

Raymond, G. (2003). Grammar and social organization: Yes/no interrogatives and the structure of responding. *American Sociological Review, 68,* 939–967. http://dx.doi.org/10.2307/1519752

Roberts, J. M. (1989). Echolalia and comprehension in autistic children. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 23,* 271–281. http://dx.doi.org/10.1007/BF02211846

Rydell, P. J., & Mirenda, P. (1994). Effects of high and low constraint utterances on the production of immediate and delayed echolalia in young children with autism. *Journal of Autism and Developmental Disorders, 24,* 719–735. http://dx.doi.org/10.1007/BF02172282

Sadock, J., & Zwicky, A. (1985). Speech act distinctions in syntax. In T. Shopen (Ed.), *Language typology and description: Volume I* (pp. 155–196). Cambridge, England: Cambridge University Press.

Scanlon, G., McEnteggart, C., Barnes-Holmes, Y., Barnes-Holmes, D., & Stewart, I. (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. *Behavioral Development Bulletin, 19,* 48–59. http://dx.doi.org/10.1037/h0100577

Schindler, S., Kissler, J., Kühl, K.-P., Hellweg, R., & Bengner, T. (2013). Using the yes/no recognition response pattern to detect memory malingering. *BMC Psychology, 1,* 12. http://dx.doi.org/10.1186/2050-7283-1-12

Shillingsburg, M. A., Kelley, M. E., Roane, H. S., Kisamore, A., & Brown, M. R. (2009). Evaluation and training of yes-no responding across verbal operants. *Journal of Applied Behavior Analysis, 42,* 209–223. http://dx.doi.org/10.1901/jaba.2009.42-209

Sigafoos, J., Arthur, M., & O'Reilly, M. F. (2003). *Challenging behavior and developmental disability*. London, UK: Whurr Publishers.

Soderstrom, M., Ko, E.-S., & Nevzorova, U. (2011). It's a question? Infants attend differently to yes/no questions and declaratives. *Infant Behavior & Development, 34,* 107–110. http://dx.doi.org/10.1016/j.infbeh.2010.10.003

Stewart, I., Barnes-Holmes, D., & Roche, B. (2004). A functional-analytic model of analogy using the relational evaluation procedure. *The Psychological Record, 54,* 531–552.

Tu, J. C. (2006). The role of joint control in the manded selection responses of both vocal and non-vocal children with autism. *Analysis of Verbal Behavior, 22,* 191–207.

von Baeyer, C. L., Forsyth, S. J., Stanford, E. A., Watson, M., & Chambers, C. T. (2009). Response biases in preschool children's ratings of pain in hypothetical situations. *European Journal of Pain (London, England), 13,* 209–213. http://dx.doi.org/10.1016/j.ejpain.2008.03.017

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