Teaching the Generic Skills of Language and Cognition:

Contributions from Relational Frame Theory

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Language and cognition are important domains in the discipline of psychology, and are often the primary focus in the study of psychological development and in the design of programs of remedial education (Lovaas, 1981; Piaget, 1967). The applied behavior analytic (ABA) approach to autism, for example, considers the establishment of language skills a primary treatment goal because these abilities are prerequisites for most other types of learning, and are frequently deficient in autistic populations (Sundberg & Michael, 2001).

Most ABA approaches to language training are based in large part on Skinner's (1957) definition of verbal operants including mands, echoics, textuals, transcription and dictation-taking, intraverbals, tacts, extended tacts, and autoclitics. According to Skinner, verbal operants differ from other operant responses because reinforcement in the former is provided indirectly through a social mediator, rather than directly through environmental contingencies. This approach to verbal behavior is functional in that it does not conceptualize language as a translation of 'meaning', and this distinction has important implications for how verbal behavior is established. In contrast, an approach to training language that emphasizes 'meaning' (rather than function) rests on the assumption that spontaneous transfer from one verbal operant to another will occur once a child is taught the 'meaning' of a word (Sundberg & Michael, 2001). For example, a semantic theory of language would predict that learning a verbal operant such as a tact (e.g., uttering “juice” in the presence of actual juice) could provide the child with words as tools that can then be applied with other verbal operants such as a mand (e.g., asking for juice). Based on this assumption, training the verbal skill of tacting will likely produce the collateral verbal skill of manding or vice versa. However, children with severe language difficulties do not typically utilize words in the manner in which the ‘words as tools’ analogy suggests (although spontaneous transfer from one verbal operant to another may be facilitated by learning in more sophisticated speakers, Sundberg & Michael, 2001). Indeed, Skinner (1957) pointed to the general imbalances found between listening and speaking skills, and between reading and writing skills, as evidence for distinct verbal functions that do not automatically transfer across behavioral domains. Training regimes based on the establishment of Skinner’s verbal operants, therefore, characteristically attempt to establish verbal operants such as mands and tacts as distinct verbal repertoires (Greer, 2002).

Although Skinner’s approach to verbal behavior was widely accepted as the first comprehensive account of language based on operant principles, and was incorporated into the design of many (if not most) behavioral interventions, it has met with criticism within and beyond the behavioral tradition. Chomsky (1959), for example, argued that Skinner’s approach to verbal behavior could not adequately account for the generativity of language found even in young children. More recently, a number of behavioral researchers have suggested that Skinner’s account ultimately failed as a basis for an experimental analysis of verbal behavior (Hayes, Barnes-Holmes, & Roche, 2001, a).

The core argument offered by Hayes et al. (2001) is that Skinner’s definition of verbal behavior was too broad. Specifically, Skinner’s definition of verbal operants rests on the mediation of reinforcement of verbal responses by a listener or listeners who have been conditioned to mediate verbal responses in a particular way. This definition turns out to be extremely broad, however. And indeed Skinner appears to have been aware of this fact when he argued that the interaction between a human experimenter and a non-human subject constitutes a small verbal community in which the former supplies reinforcement in much the same way as a listener. Although appealing in its simplicity, particularly for a basic science of behavioral psychology that was primarily focused on the behavior of nonhumans, a definition of verbal behavior that effectively includes most human-nonhuman interactions renders superfluous the conceptual class <u>verbal</u>.

One solution to this problem is to redefine verbal events in terms of what are called <u>derived arbitrary stimulus relations</u> (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2000; Chase & Danforth, 1991; Hayes et al, 2001). According to this view, the derivation of <u>multiple</u> stimulus relations (explained subsequently) is believed to be the core process involved in human language and cognitive abilities. As well as offering a new functional definition and experimental analysis of verbal behavior, some researchers have suggested that it may be possible to harness these newly defined verbal processes in the development of programs for remediating deficits in language and cognition (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2001). In Part I of the present chapter we outline the basic features of this approach, known as Relational Frame Theory (RFT). In Part II we turn our attention to RFT-driven research that has direct implications for the design of empirically supported educational methods.

PART I

RELATIONAL FRAME THEORY

Defining Derived Relational Responding

At its simplest, relating may be defined as responding to one event in terms of another, and is demonstrated readily by non-human and human organisms alike (Reese, 1968). Most living organisms, with a history of appropriate training, are able to respond to the nonarbitrary relations among the physical properties of stimuli or events. For example, adult rhesus monkeys can be trained to select the taller of two stimuli (Harmon, Strong, & Pasnak, 1982), and this type of behavior may be described as relational responding because it relies upon relative comparisons among the stimuli involving discriminations based on their formal properties (i.e., one stimulus is actually physically taller than the other).

Relational responding, however, becomes more complex when it is brought under the control of contextual features beyond the formal properties of the stimuli. Arbitrarily applicable relational responding is the term used to describe relational responses that can be brought to bear on any stimuli presented in an appropriate context. For example, if you are told that “X is taller than Y”, you can derive that Y is shorter than X without actually seeing what X and Y refer to. In this way, arbitrarily applicable relational responding may be controlled by contextual cues that are modified entirely by social whim. For instance, in a game, children may be instructed that "Tall means short and short means tall." In this case, the relational functions of tall and short are applied in a purely arbitrary fashion, and are not governed by the actual formal dimensions of the stimuli.

In order for relational responding to come under appropriate forms of contextual control, as would be required for competent performances in the example of the children’s game above, children must learn to discriminate between the relevant features of the task (i.e., responding relationally to events in the presence of appropriate contextual cues), and the irrelevant features of the task (e.g., responding to the physical properties of the stimuli). This training history is clearly illustrated in the establishment of the bidirectional stimulus relations that emerge between words and their referents that form a large part of early naturalistic language interactions.

Early experiences of learning to name objects comprise a wealth of name-object and object-name relations across an extensive range of objects and names. That is, young children are trained as follows: given name of object → select object (the name-object relations are explicitly trained), and given object → select name of object (in this case the object-name relations are explicitly trained). In essence, reinforcement is being provided for responding in accordance with the bidirectional relations between object names and actual objects and vice versa. Reinforcement for such bidirectional responding is rich in early natural language interactions but occurs only in certain contexts, such as in the presence of phrases like "What's that?" and the juxtaposition of objects and words. According to RFT, this training in bidirectional relations ensures that in certain contexts name-object relations reliably predict object-name relations and vice versa, and <u>generalized</u> bidirectional responding emerges. For example, explicit training in a new name-object relation (given name "teddy" → select the teddy) may result in the <u>derived</u> or untrained object-name relation (given the actual teddy and asked "What's this?" → say the name "teddy"). This training history is brought to bear on novel stimuli by the presence of specific contextual cues (e.g., "What's this?") that control responding in accordance with the bidirectional stimulus relations. Note that in the example of naming, the stimulus relations are entirely arbitrary because in practically all cases, the words do not bear any formal resemblance to the actual objects to which they refer (i.e., the word "teddy" looks nothing like an actual teddy).

From the perspective of RFT, arbitrarily applicable relational responding has three defining properties – mutual entailment, combinatorial entailment, and the transformation of stimulus functions. The term mutual entailment is used to describe the basic bidirectionality of relational responding outlined previously. Arbitrary stimulus relations are always mutual -- if A is related to B, B is always related to A. That is, if the first relation is specified, the second relation is entailed (hence the term "mutual entailment"). Technically defined, mutual entailment applies when, in a given context, A, for example, is related in a characteristic way to B, and as a result, in that context, B is related in another characteristic way to A.

The term combinatorial entailment is used to describe a derived stimulus relation in which two or more relations mutually combine. For example, if you are only told that A is more than B and B is more than C, you can derive that A is more than C and C is less than A. From a development or educational perspective, it is likely that combinatorially entailed relations emerge later than mutually entailed relations.

The third defining feature of arbitrarily applicable relational responding is the transformation of stimulus functions. This term is employed when the functions of a given stimulus are modified or changed as a result of derived relations with other stimuli. If, for example, an individual is told that B is the opposite of A, and a conditioned punishing function is attached to A, the functions of B may be transformed such that it becomes a conditioned reinforcer, because of its participation in a relation of opposition with A (Roche & Barnes, 1997; Roche, Barnes-Holmes, Smeets, Barnes-Holmes, & McGeady, 2000).

Just as the relational response is controlled by context, the transformation of stimulus functions must also come under contextual control. Consider some of the perceptual functions of a lemon, including its bitter taste, its rough texture, and the fact that it is bright yellow in color. When an individual is asked to "Imagine a lemon," many of these perceptual features become psychologically present. In the technical language of RFT, this psychological event is described as follows. The word “lemon” and actual lemons participate in what is called a relational frame of coordination. In addition, the words “imagine a” function as a context in which some of the perceptual functions (especially visual functions) are elicited based on the relational frame. In another context (e.g., “imagine tasting a . . .”), other functions would be elicited. Contextual cues, therefore, not only control the type of relational frame involved, but the transformation of functions that are enabled by the frame in question.

Relational Framing

Relational Frame Theory employs the generic term relational frame to describe particular patterns of arbitrarily applicable relational responding (Hayes & Hayes, 1989). A number of generic relational frames have been discussed in the literature (although others may yet be identified). These include frames of coordination, opposition, distinction, comparison, hierarchy, and deictic frames of perspective-taking (Hayes, Barnes-Holmes, & Roche, 2001, b). Perhaps the most commonly known pattern of relational responding involves the frame of coordination, in which the relations are ones of identity or similarity. The example of naming described previously is an often-cited instance of the frame of coordination, and this frame is probably one of the first to be established.

The relational frame of opposition requires the abstraction of a dimension along which stimuli can be ordered and distinguished in equal ways from a reference point. In natural language, opposite typically implies the relevant dimension. For example, saying that ‘fast is the opposite of slow’ implies that speed is the dimension along which the related events are to be ordered. Furthermore, RFT suggests that the frame of opposition will emerge later than coordination because the combinatorially entailed relations within frames of opposition are frames of coordination. For example, if fast is the opposite of slow, and slow is the opposite of quick, then fast and quick are the same (i.e., coordinated), not opposite.

Relational frames of distinction involve responding to the differences among stimuli or events, typically also along a particular dimension. However, in frames of distinction, the relevant dimension is rarely implied. Consider, for instance, the statement "This is not a person of average intelligence". Based on only this information, I cannot determine whether this person is of extremely high or extremely low intelligence. Furthermore, a combinatorially entailed difference relation is unspecified. For example, if you are told that A is different to B, and B is different to C, then A and C may be the same or different. This type of unspecified relation is a defining property of the frame of distinction.

There are many specific types of frames of comparison, including bigger and smaller, and faster and slower. These frames involve responding to events in terms of a quantitative or qualitative relation again along a specified dimension (e.g., speed). If I say that 'A lion is faster than a dog and a dog is faster than a mouse', the events can be compared along the dimension of speed, and you can derive that 'the lion is faster than the mouse and the mouse is slower than the lion.' Furthermore, comparative relations may be made more specific by quantification of the dimension. For example, if you are told that 'A lion is twice as fast as a dog and a dog is twice as fast as a mouse', you can now derive that the lion is exactly four times faster than the mouse and the mouse is four times slower than the lion.

The final family of relational frames that we will describe here involves deictic relations, which appear to be involved in perspective-taking (see Barnes & Roche, 1997; Hayes, 1984). The three key deictic frames seem to be I and YOU, HERE and THERE, and NOW and THEN. Relational Frame Theory argues that taking a perspective involves responding in accordance with these relational frames. In other words, taking a perspective involves responding from I, HERE, and NOW with respect to events located THERE and THEN. For example, saying "I cannot see what you see" requires that the speaker distinguish between I and YOU (i.e., that we do not always see the same things), and that what I am seeing HERE and NOW is not what YOU are seeing THERE and THEN. We will return to this type of relational framing towards the end of the chapter.

There is much more to RFT than has been presented thus far. For example, RFT also describes the relating of relations and the relating of relational networks with other relational networks. These processes are believed to account for competence in verbal skills such as analogy, metaphor, and story telling, but it is beyond the scope of the current chapter for these issues to be described fully (but see Hayes et al., 2001, a, for a book-length account). The important point to be gleaned here, however, is that from the RFT perspective deriving relations underpins developmental or educational achievement and a small number of psychological processes are sufficient to yield the full gamut of cognitive skills.

PART II

RESEARCH IN RELATIONAL FRAME THEORY AND ITS IMPLICATIONS FOR EDUCATION

From the perspective of RFT, over-arching relational skills can be taught and subsequent improvement in relational responding should lead to improved abilities in areas of cognition and language, as well as in intelligence in general (Hayes, 1994). The RFT approach to education has two core assumptions. First, skills in relational responding provide the basis for a wide range of cognitive abilities that correlate with educational achievement. Second, multiple-exemplar training provides an important method for harnessing these cognitive skills and building up flexibility in relational repertoires. The next section of the chapter briefly describes a number of RFT studies in which multiple-exemplar training was successfully employed to establish novel relational repertoires. In each study, a relational or cognitive deficit is identified in the behavior of the experimental participants, and then the study seeks to remediate this deficit by reinforcing one or more exemplars of the relevant relational repertoire. These studies thus provide examples of how the RFT approach can inform educational practice. We should add that multiple-exemplar training is not exclusive to RFT and indeed is an inherent feature of traditional educational practice (Englemann & Carnine, 1982). For example, children are often presented with tasks that are grouped by content that establish flexibility in over-arching relational skills (e.g., adding numbers together, filling in missing numbers in a sequence, or identifying the nouns in sentences). However, an approach to education based on RFT seeks to identify tasks that can grouped according to the relational skills involved rather than according to traditional content areas.

Derived Transformations of Function in Accordance with Symmetry

One of the first RFT-based studies that attempted to analyze the development of relational framing in young children involved a systematic analysis of the role of multiple-exemplar training in establishing simple derived relations (Barnes-Holmes, Barnes-Holmes, Roche, & Smeets, 2001, b). In this study, young normally developing children aged between four and five years old were selected and a task was designed to investigate the transformation of function in accordance with symmetry. The children were first trained in an action-object conditional discrimination task. During this training when the experimenter waved, choosing a toy car was reinforced with feedback (i.e., the trained relation was wave-car), and when the experimenter clapped, choosing a doll was reinforced (i.e., the trained relation was clap-doll).

Following this training, the children were tested without feedback for the derived object-action symmetry relations. That is, when the experimenter now presented a toy car, the child was required to wave (i.e., the tested relation was car-wave), and when the experimenter presented a doll, the child was required to clap (i.e., the tested relation was doll-clap). Of the sixteen children, eleven failed to show the target derived symmetry performances on the first test. At this point in the study, a multiple-baseline design was used to phase in the introduction of explicit symmetry or object-action training for those children who failed the symmetry test. In other words, after failing to demonstrate symmetry, some children were then reexposed to the same trials as in the symmetry test, but corrective feedback was provided after each trial. In order to test the effect of this training, the children were thereafter exposed to an entirely new set of actions and objects in the same training and testing format. In simple terms, the children were trained on one exemplar and then tested on another. With the multiple baseline design, some children were exposed to several sessions of training and testing with the novel sets of stimuli prior to receiving the explicit symmetry training in order to determine whether these children would improve in the absence of explicit object-action training across exemplars.

The results of the studies overall showed that for all eleven children who failed the first symmetry test, explicit symmetry training was effective in establishing the derived transformations of function in accordance with symmetry, and that for the majority of children only one exemplar of training was necessary for the derived performance to occur on a novel set of stimuli. As an aside, a number of similar experiments employed an alternative naming intervention commonly used in education, and found this to be much less effective than the multiple-exemplar training in establishing the derived test performances (Barnes-Holmes, Barnes-Holmes, Roche, & Smeets, 2001, a).

One issue that arose from this series of studies was the very limited number of exemplars required for the children to demonstrate the target derived performances. This suggested that the exemplar training simply activated a previously established relational repertoire of symmetrical responding, and the age and verbal sophistication of the children supported this conclusion. The obvious limitation of this work, therefore, is that it did not demonstrate the establishment of previously absent repertoires of relational framing, which is often what is required in educational programs. The three studies outlined subsequently address this concern.

Teaching Derived Manding

Establishing a manding repertoire is very important for children with language deficits, because it provides immediate control of the social and non-social environment, and facilitates the development of speaker and listener repertoires (Sundberg & Michael 2001). It is not surprising, therefore, that mands are typically the first verbal operants humans acquire naturally or are trained to acquire in educational programs (Bijou & Baer, 1965; Skinner, 1957).

One of the most common difficulties in educational programs that attempt to build manding repertoires in individuals for whom they are found to be absent is the identification or establishment of a variety of deprivation states. Although many kinds of deprivation may already be present in a child with autism, for example, these may remain unknown to the instructor who is presented with generic responses such as crying and pulling, but not with specific indicators of deprivation (Sundberg & Michael, 2001). Given that children with autism have successfully demonstrated derived relational responding (Eikeseth & Smith, 1990), a recent study attempted to establish derived manding via relational frames in young normally-developing and autistic children (Murphy, Barnes-Holmes, & Barnes-Holmes, 2003).

The experimental sequence employed in this study consisted of three phases: mand training, conditional discrimination training, and testing for a derived transfer of mand functions. During Phase 1, participants were trained to use two stimulus cards, each with an abstract symbol on it, to mand for a pink token and a yellow token, respectively (these two cards will be referred to as A1 and A2). A 'state of deprivation' was created by presenting participants with a task that required them to mand for the appropriate number of either pink or yellow tokens. That is, the participant was presented with a token mat that contained a number of pink and/or yellow tokens and to complete a mand training trial successfully, the participant had to mand for only those pink or yellow tokens that were needed to complete the missing set (i.e., if a participant manded for a token that he or she did not need, the trial was recorded as incorrect).

When a participant successfully completed mand training, he or she was trained in two conditional discriminations using a matching-to-sample procedure. During this training, the children were taught to relate the symbol on the A1 stimulus card to a second symbol (B1), and to relate this second symbol to a third symbol (C1). The training also involved teaching the children to relate the A2 symbol to the B2 stimulus, and the B2 stimulus to a C2 stimulus. In this way, two relational frames of coordination were established (A1-B1-C1 & A2-B2-C2). The critical test from the RFT perspective involved determining if the children would spontaneously use the two C stimuli to mand for the appropriate colored tokens. In other words, would the yellow manding function of A1 transfer via coordination to C1, and similarly the pink manding function transfer from A2 to C2?

The three normally-developing children and two of the autistic children readily demonstrated the predicted derived transfer of mand functions on their first exposures to the test. However, one of the autistic children completely failed the derived transfer test (the data for this child are presented in Figure 1). Consequently, this child was exposed to exemplar training in the derived transfer of mand functions. That is, when the child failed to show the derived transfer he was immediately exposed to the derived transfer tasks again, but this time corrective feedback was provided after each response (labeled as transfer training in Figure 1). Subsequently, the child was reexposed to the mand training, conditional discrimination training, and derived mand testing, but using a completely novel set of abstract symbols for the A, B, and C stimuli (e.g., set D, E, and F). In total, the child required five exemplars of explicit derived mand training before successfully demonstrating a derived transfer of mand functions on a novel set of stimuli (set M, N, and O) in the absence of corrective feedback. As can be seen from Figure 1, the improvement in derived manding was gradual across exemplars, and this suggests that a genuinely novel relational repertoire was established in the behavior of this child.

INSERT FIGURE 1 ABOUT HERE

This recent research provides a good example of how the relational concepts of RFT, and its emphasis on exemplar training, can be brought to bear on more traditional behavioral approaches to the teaching of verbal behavior. The one child who repeatedly failed the derived transfer of mand functions test clearly demonstrated that directly trained and derived manding may exist as functionally distinct verbal skills, and that the latter may require extensive remediation in an educational context to become firmly established in a child's behavioral repertoire. Clearly, much more work remains to be done, but this recent study indicates that the application of RFT methodologies and strategies to educational research and practice may be of considerable value.

Establishing the Relational Frames of More-Than, Less-Than, and Opposite

An important cognitive skill that children are required to master involves relational reasoning, particularly when that reasoning gives rise to conclusions that were not explicitly taught or instructed. The ability to take generic relational skills and apply them to new content across a range of contexts constitutes an important educational goal. A recent RFT study systematically examined how generative relational reasoning might be established when it is found to be absent in the behavior of young children (Barnes-Holmes, 2001). This study used a basic problem-solving task to test and train derived relations in accordance with the relational frames of more-than, less-than, and opposite. The basic task employed for establishing both frames involved presenting a child with a number of identically sized paper circles (these were referred to as "coins" because the task involved choosing one or more of the circles on the basis of their stated value). On each trial, the Experimenter described specific more-than, less-than, or opposite relations among the coins in terms of value (because the coins were actually the same physical size the comparative values were entirely arbitrary, as is the case with real money). Based on this comparison, the child was then asked to pick the coin that would buy as many sweets as possible (i.e., the most). For example, during a more-than trial, the child might be instructed as follows: If this coin (Experimenter points to the first coin designated as coin A) buys more sweets than this coin (Experimenter points to coin B), and this coin (Experimenter points to coin B again) buys more sweets than this coin (Experimenter points to coin C): which would you choose to buy as many sweets as possible? In this case, a correct response consisted of the child selecting the first coin (A). This was the format employed for all trials, and each training trial was consequated with corrective feedback. Numerous sets of coins were employed to create multiple exemplars for training the more-than, less-than, and opposite relations and testing the appropriate derived relations.

Three normally developing children each required 30-40 experimental sessions before demonstrating responding in accordance with the target arbitrary relations of more-than and less-than. After this extensive training and testing, the children also demonstrated flexible relational repertoires in that they could respond appropriately: (1) when the Experimenter pointed to the coins in any direction from left to right or vice versa and from top to bottom and vice versa; (2) when presented with a novel set of three random objects instead of coins; and (3) when asked which coin(s) they would <u>not</u> choose in order to buy as many sweets as possible.

Although the generative and flexible nature of the performances that were established via exemplar training were impressive, given the complete absence of more-than and less-than relational reasoning skills in the children at the outset of the study, the analysis of opposite relations produced an even greater level of relational complexity. In order to study opposite relations, the task was modified. During the first test for opposite responding, a child may have been presented with four coins and asked: "If this coin (coin A) buys many sweets, and is opposite to this coin (coin B), and if this coin (coin B) is opposite to this coin (coin C), and if this coin (coin C) is opposite to this coin (coin D): which would you take to buy as many sweets as possible?" The correct answer on this trial involved selecting coins A and C, because A buys many and is opposite to B (so B buys few), B is the opposite to C (thus C is the same as A and buys many), and C is the opposite to D (thus if C buys many, D buys few).

Three normally developing children each required extensive exemplar training before demonstrating a complex and flexible repertoire of responding in accordance with the target arbitrary relations of opposite. In the final test phases, the children demonstrated appropriate responding: (1) in the presence of a novel Experimenter; (2) when the Experimenter pointed to the coins in any direction from left to right or vice versa, from top to bottom or vice versa or in a completely random sequence; (3) when presented with a set of novel objects instead of coins; (4) when asked which coin(s) they would not choose in order to buy as many sweets as possible; and (5) when presented with various numbers of coins or other items up to and including ten.

The foregoing studies provided evidence that highly complex and flexible repertoires of relational responding in accordance with the relational frames of more-than, less-than, and opposite may be effectively established with very young children by a history of multiple-exemplar training. Although the same basic methodology of training across multiple exemplars was employed to establish these relational repertoires, a number of features specific to the various frames were observed. First, responding arbitrarily in accordance with more-than and less-than appeared easier than responding in accordance with opposite. Second, responding in accordance with nonarbitrary more-than and less-than relations was useful in establishing the more complex arbitrary relations (e.g., different numbers of sweets were placed on top of the coins to create actual comparisons of more-than and less-than in order to facilitate the transition between nonarbitrary and arbitrary responding). Third, many exemplars of training were needed to establish even mutually entailed opposite relations. Fourth, training combinatorially entailed opposite relations was even more difficult than mutually entailed relations. Fifth, explicit instructions with regard to the relation of "same" helped to facilitate combinatorially entailed opposite relations (i.e., If A is opposite to B, and B is opposite to C, then A and C are the same). Sixth, participants required many exemplars of training to derive the opposite relations between two, three, four, and five coins, but needed few or no exemplars of training when working with six, seven, eight, nine, or ten coins (i.e., this would suggest that increasing the number of trained coins helped establish opposite responding as a generalized cognitive skill that could be applied arbitrarily, in principle, to any number of stimuli).

The types of studies outlined so far address what appear to be clear examples of generative or novel verbal behavior and relational reasoning. Relational Frame Theory, as an account of human verbal behavior, is directly relevant to these domains. However, RFT also approaches cognitive skills that do not immediately appear to be primarily relational in largely relational terms. Although such an approach may seem counterintuitive, preliminary empirical work in the domain of perspective-taking, or what cognitive psychologists call Theory of Mind (ToM), suggests that there may be some value in adopting a relational interpretation of this phenomenon.

Relational Responding and Perspective-Taking

According to RFT, cognitive perspective taking (see Howlin, Baron-Cohen, & Hadwin, 1999) involves increasingly complex forms of contextual control of the perspective-taking relational frames of I-YOU, HERE-THERE, and NOW-THEN. As was the case with the establishment of the frames described previously, RFT would predict that the most effective means of establishing these repertoires would be to target the relational frames or generic relational repertoires directly.

As part of a complex research program on perspective-taking in children, Barnes-Holmes (2001) attempted to establish the relational skills that appear to underlie perspective-taking in young children. In this study, responding in accordance with the relational frame of I-YOU was the first perspective-taking frame to be targeted directly. For illustrative purposes, consider the following simple scenario. The participant was presented with two colored blocks and asked: "If I (Experimenter) have a green block, and YOU have a red block: which block do I have? Which block do you have?" If the child responded incorrectly to either question, corrective feedback was provided until correct responding was established. Once these simple I-YOU relations were established, the I and YOU relations were reversed in order to facilitate flexibility in this type of relational responding. The participant, for example, was asked: "If I was YOU, and YOU were ME: which block would YOU have? Which block would I have?"

Once simple and reversed I-YOU relations were established, responding in accordance with HERE-THERE and its combinations with I-YOU was targeted directly. Consider the following scenario: "I am sitting HERE on the black chair, and you are sitting THERE on the blue chair: where are YOU sitting? Where am I sitting?" With simple HERE-THERE relations in place, reversed HERE-THERE relations were then targeted. During these trials, for example, the participant may have been asked: "I am sitting HERE on the black chair, and you are sitting THERE on the blue chair. If HERE was THERE, and THERE was HERE: where would YOU be sitting? Where would I be sitting?" In this particular trial-type, it is apparent that the HERE-THERE relation is reversed, but the I-YOU relation remains simple. When responding to this type of complex HERE-THERE reversal was established, the task was made even more complex by reversing both I-YOU and HERE-THERE statements simultaneously. Consider the following example of what was called a double reversed I-YOU/HERE-THERE relation: "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 YOU be sitting? Where would I be sitting?"

Once the perspective-taking frames of I-YOU and HERE-THERE were established, the relational frame of NOW-THEN was targeted. One feature of NOW-THEN responding that differed from HERE-THERE responding is that I and YOU could not be presented together in each trial because responding to I-YOU and NOW-THEN simultaneously renders some of the relations unspecified. In order to establish simple patterns of responding in accordance with NOW-THEN, the participant, for example, was presented with the following scenario: "Yesterday I was watching TV, today I am reading. What am I doing NOW? What was I doing THEN?" Once this pattern of simple NOW-THEN responding was established, the relation was reversed as follows: "Yesterday I was watching TV, today I am reading. If NOW was THEN, and THEN was NOW: what would I be doing NOW? What would I be doing THEN?"

With flexible patterns of NOW-THEN responding established, NOW-THEN and HERE-THERE were mixed to produce new types of double reversed relations. Consider the following example: "Yesterday, I was sitting THERE on the red chair, today I am sitting HERE on the green chair. If HERE was THERE, and THERE was HERE, and if NOW was THEN and THEN was NOW: where would I be sitting NOW? Where would I be sitting THEN?"

In the Barnes-Holmes study two normally developing children were exposed to these relational perspective-taking procedures. One seven-year-old female mastered the entire training protocol but required training on the reversed and double reversed relations. A three-and-a-half year old boy was also exposed to I-YOU and HERE-THERE trial-types, and required extensive training across exemplars, particularly on the reversed and double reversed relations. In a more recent replication of this work by McHugh, Barnes-Holmes, and Barnes-Holmes (2003), extensive and systematic exemplar training has been necessary to establish even simple NOW-THEN relations in a four-year old child.

Although these RFT data on the teaching of perspective-taking are preliminary, the protocols that have been developed in this research have been subjected to systematic empirical analysis using cross-sectional developmental methodologies (McHugh, Barnes-Holmes, &

Barnes-Holmes, in press). The findings from this research suggest that the relational skills that are involved in the perspective-taking frames are required in order to successfully complete ToM tasks that have typically been used to study and teach perspective-taking in educational contexts. Furthermore, additional RFT protocols are currently being developed to study more advanced forms of perspective-taking, including false belief and deception. Treating perspective-taking as an inherently relational activity, therefore, appears to promise new insights and methodologies for studying and teaching this poorly understood and complex human skill.

Summary and Conclusions

Based on a relatively small array of psychological and behavioral processes, RFT allows even complex verbal events, such as cognitive perspective-taking, to be approached behaviorally and established systematically. In the current chapter we have outlined preliminary findings from a research agenda in the experimental analysis of human behavior that has clear and widespread implications for empirically validated educational practices. This exciting research initiative consists of studies in which both simple and complex forms of derived relational responding were targeted for assessment and remediation using interventions indicated by RFT. A key theme running throughout the diverse content areas covered in this chapter is the role of a basic understanding of relational responses in teaching important cognitive skills in both children and adults. It is our belief that identifying the core relational units involved in these cognitive skills, and targeting their fluid and flexible development with appropriate training, will lead to significant improvements in the methods used in many educational settings.

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FIGURE CAPTION

Figure 1

Mands: Percent correct across blocks of 6 trials. A1-B1, A2-B2/B1-C1, B2-C2/D1-E1, D2-E2/E1-F1, E2-F2/J1-K1, J2-K2/K1-L1, K2-L2/M1-N1, M2-N2/N1-O1, N2-O2: Percent correct across blocks of 10 matching-to-sample training trials in each set. Derived Mand: Test for derived transfer of mand functions A1-C1, A2-C2/D1-F1, D2-F2/J1-L1, J2-L2/M1-O1, M2-O2. Transfer Training: Percent correct across blocks of 6 training trials involving direct training of transfer of mand functions. Asterisks indicate break of at least one day between sessions.