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Contextual control over derived relational responding in a teenager with autism

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ABSTRACT

The derived relational repertoire of a teenager with autism spectrum disorder was tested in two slightly different contexts using a multiple treatments reversal design. Both contexts involved match-to-sample training and testing with abstract stimuli, but one involved referring to the stimuli as the names and sounds of "animals." In the latter context, training of baseline relations was more efficient and derivation was shown to be more likely. This demonstrates the importance of contextual control over derived relational responding and suggests that the animal context may be a useful one for assessing and training derived relations for individuals in which the derived relational repertoire is not as robustly established across contexts.

Derived relational responding (DRR) is an empirical effect in which training relations between arbitrary stimuli results in the emergence of a number of additional untrained relations. For example, in the case of stimulus equivalence (e.g., Sidman, 1971), the most well-known demonstration of DRR, if an individual is taught that an arbitrary stimulus A goes with a second arbitrary stimulus B, then they may derive that B goes with A. This is an instance of symmetry, or more generically, mutual entailment, in which learning a relation between two items in one direction (e.g., A→B) results in derivation of the relation in the other direction (i.e., B→A) without specific teaching. If the individual is further taught that a third arbitrary stimulus, C, goes with B, then they may derive not only that B goes with C but also that A goes with C, and vice versa. The latter performances, referred to as transitive, or more generically, as instances of combinatorial entailment, involve deriving a new relation (or relations) through combination of previously acquired relations (e.g., if A→B and C→B then A→C and C→A).

At this point, there is substantial empirical evidence linking DRR with language ability (Rehfeldt & Barnes-Holmes, 2009), and thus an increasing number of researchers interested in promoting language in children with autistic spectrum disorder (ASD) are focusing on this phenomenon (McLay, Sutherland, Church, & Tyler-Merrick, 2013; Ming, Moran, & Stewart, 2014; Moran, Stewart, McElwee, & Ming, 2014; Murphy, Barnes-Holmes, & Barnes-Holmes, 2005; O'Donnell & Saunders, 2003; Rehfeldt, 2011). The current study did so within a Relational Frame Theory (RFT; Dymond & Roche, 2013; Hayes, Barnes-Holmes, & Roche, 2001) framework. RFT suggests that DRR and language are linked because both are examples of generalized contextually controlled relational responding (Barnes, 1994; Stewart & McElwee, 2009) based on a history of multiple exemplar training (MET) in which the functions of particular contextual cues that come to control patterns of relational responding are established.

In the case of typically developing children, this process happens through everyday interactions with caregivers and other members of the socio-verbal community. Word-object bi-directional relational responding, a type of symmetrical or

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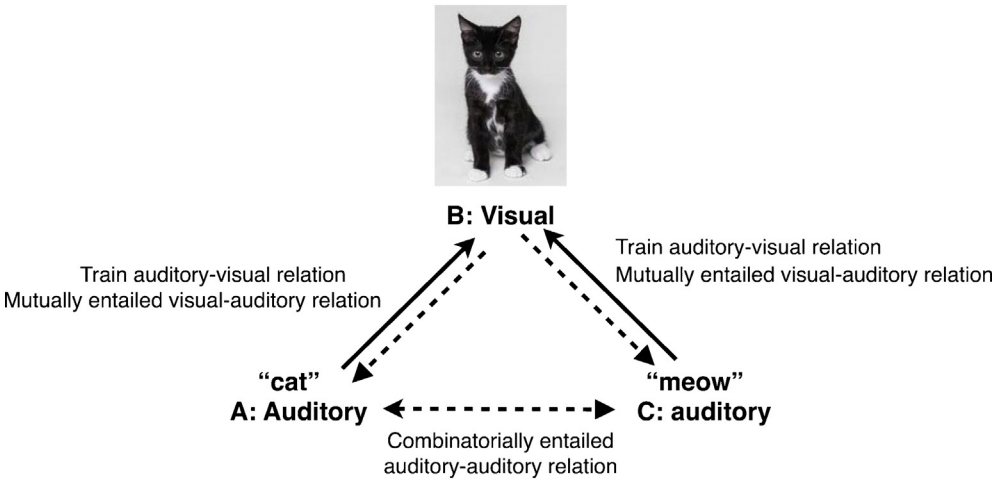

Fig. 1. Mutually and combinatorially entailed relations among animal (visual), name (auditory), and sound (auditory) relations.

mutually entailed coordinate relational responding, is seen as the earliest form of DRR to be established. In this case, exemplars of bi-directional word-object relations frequently occur in the context of joint attention[1] games that include cues, such as the word "is" (e.g., "Where is the [object name]," "What is this called?"), which come to control this pattern. Learning this form of DRR then likely provides a stepping stone for coming under the control of an assortment of related as well as additional cues associated with more complex forms including combinatorially entailed coordinate relations (i.e., stimulus equivalence) as well as a variety of classes of noncoordinate relations, such as opposition, comparison, distinction, and so on (e.g., Barnes-Holmes, Barnes-Holmes, & Smeets, 2004; Barnes-Holmes, Barnes-Holmes, Smeets, Strand, & Friman, 2004; Berens & Hayes, 2007; Carpentier, Smeets, & Barnes-Holmes, 2003; Rehfeldt & Barnes-Holmes, 2009; Roche & Barnes, 1997), which collectively provide the basis for the full gamut of generative language.

While typically developing children learn contextually controlled relational responding through exposure to the natural language environment in this way, many children with ASD do not easily do so and thus show deficits with respect to linguistic generativity (e.g., Devaney, Hayes, & Nelson, 1986; Eikeseth & Smith, 1992; O'Donnell & Saunders, 2003; Rehfeldt & Barnes-Holmes, 2009; Rehfeldt, Dillen, Ziomek, & Kowalchuk, 2007; Stewart, McElwee, & Ming, 2013). Such children might benefit greatly from focused training with a view to establishing effective contexts for DRR. However, since individuals with ASD may be less responsive to typical language contexts, one potentially important direction might be to investigate contexts that appear to be particularly influential to them. The aim of this study was to examine one such context.

One context that we hypothesized might be particularly effective for exploring early emergent coordinate DRR is the game of linking animals with both their names and the sounds they make (see Fig. 1). This context is the basis of many children's songs, games, iPhone apps, and common activities in preschool/toddler programs. It is recommended for toddler language development (American Speech-Language-Hearing Association, 2012), and it is common in early intensive behavioral intervention (EIBI) programs. Indeed, learning animal names and sounds may be among the first opportunities that children have to develop derived equivalence responding. In fact, consistent with this suggestion, Lipkens, Hayes and Hayes (1993) successfully used this context to chart the emergence of DRR including both mutually and combinatorially entailed derived relations in a very young typically developing child.

In our own laboratory, we used this context during pilot testing (Ming, Stewart, & McElwee, 2013) of an assessment tool for DRR skills, the Training and Assessment of Relational Precursors and Abilities (TARPA; Moran, Stewart, McElwee, & Ming, 2010; Moran et al., 2014). During this testing, a number of students with ASD who scored at Level 3 of the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) showed a pattern of being able to correctly derive mutually and combinatorially entailed relations during activities that included learning about the names of "animals" and the sounds they made (all experimenter created arbitrary stimuli), but failing such tests given a more typical match-to-sample (MTS) context with similar types of arbitrary auditory and visual stimuli in which they were required to select stimuli that "go together." Two students in particular showed what appeared to be an important pattern of reversals in their abilities dependent on the context. After passing tests of combinatorial entailment given the context of the animal game, each was subsequently unable to pass a combinatorial entailment test after training using a new set of similar abstract stimuli in the absence of that context, but then passed after being trained and tested with yet another novel set of stimuli in the animal context (Ming et al., 2013). Given these findings, we set out to test this potential pattern more systematically.

[1] Joint attention has been defined as 'synchronization of the child's attention with that of another person in the sharing of an object or event, under the control of eye contact and cues' (Novak, 2012, p. 80).