

RECENT RESEARCH ON EMERGENT VERBAL BEHAVIOR:  
CLINICAL APPLICATIONS AND FUTURE DIRECTIONS

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This paper describes recent studies that have evaluated the functional independence of verbal operants. Procedures that facilitate the emergence of untrained verbal operants and important areas of future research to increase efficiency of language programs for children diagnosed with developmental disabilities are discussed.

*Key words:* emergent relations, functional independence, language training, verbal behavior

Previous research on the acquisition of verbal behavior in children with developmental disabilities has focused on teaching four primary verbal operants (Sundberg & Michael, 2001; Sundberg & Partington, 1998). The *mand* is evoked by an establishing operation and is maintained by access to a response-specific reinforcer. For example, a child says “water” after engaging in physical activities (i.e., the motivative operation manipulation) that result in access to water (i.e., the reinforcer). The *tact* is under the discriminative control of a nonverbal stimulus and produces generalized reinforcers. For example, a child says “dog” while observing a dog at a park, which results in praise from a parent. A response that has point-to-point correspondence with a preceding vocal stimulus is an *echoic* (e.g., saying “fish” after someone says “fish”). An *intraverbal* lacks point-to-point correspondence with an antecedent verbal discriminative stimulus ( $S^D$ ). Answering “a car” following the verbal stimulus “What do you ride in?” is an example of an intraverbal response.

In Skinner’s (1957) analysis of verbal behavior, he stated that each verbal operant is maintained by unique antecedent and consequence events and, therefore, is functionally independent. That is, training a specific response under one source of control (e.g., mand) does not necessarily result in the emergence of other verbal operants (e.g., tact) without direct instruction. Skinner’s work served as a catalyst for a growing body of literature that has evaluated the functional independence of verbal operants and the emergence of untrained verbal operants. In this review, we will describe recent studies that have evaluated the functional independence of verbal operants and procedures designed to promote emergent verbal behavior. We will suggest directions for future research to identify procedures that reliably produce emergent verbal behavior in children with developmental disabilities.

Several studies have demonstrated the functional independence of verbal operants, thus providing support for Skinner’s (1957) assertion that learners may need specific training for a vocal response to occur across a variety of contexts (Hall & Sundberg, 1987; Lamarre & Holland, 1985). More recently, research has focused on identification of the conditions under which topographically similar responses occur across verbal operants. Kelley, Shillingsburg, Castro, Addison, and LaRue (2007)

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examined the functional independence of mands and tacts for three children with developmental disabilities. The experimenter trained one set of stimuli as a tact relation and the other set as a mand relation. The experimenter also probed the untrained relation (i.e., either a mand or tact) after the participants acquired the trained relation. Results indicated that the untrained relation emerged in 9 of 15 opportunities. Participants in the Kelley et al. study and in a study by Petursdottir, Carr, and Michael (2005) did not reliably emit mands after tact training; however, other studies have demonstrated this type of emergence (Egan & Barnes-Holmes, 2009; Wallace, Iwata, & Hanley, 2006).

One interesting finding is that participants were slightly more likely to emit tacts after mand training and were less likely to engage in mands after tact training, which is consistent with results from other studies (e.g., Petursdottir et al., 2005). In the Petursdottir et al. study, participants engaged in self-echoics in the presence of the stimulus during mand training, which may have facilitated the emergence of tact relations (Esch, Esch, McCart, & Petursdottir, 2010). That is, participants repeated the target response when they had access to the item without a requirement or consequence for doing so. Future research might evaluate the role of self-echoics in the emergence of untrained verbal operants.

A limitation of the Petursdottir et al. (2005) and Kelley et al. (2007) studies is that the antecedent arrangement was "impure." That is, the mand included components of the tact relation (i.e., the sight of the target item). Participants may have been more likely to emit the vocal response during mand probes because of the presence of the item rather than the relevant establishing operation. An important implication of this finding is that incorporation of stimuli that occasion trained verbal operants may facilitate the emergence of untrained verbal operants (Stokes & Baer, 1977).

The research described above evaluated the functional independence of mands and tacts; however, other research has examined emergent intraverbal behavior (Perez-Gonzalez, Garcia-Asenjo, Williams, & Carnerero, 2007; Perez-Gonzalez, Herszukowicz, & Williams, 2008; Petursdottir, Carr, Lechago, & Almason, 2009; Petursdottir, Olafsdottir, & Aradottir, 2008). The study by Petursdottir et al. (2008) evaluated emergent unidirectional and bidirectional intraverbal relations following either tact or listener training. The experimenter conducted listener training by placing three pictures of fruit in an array and providing the instruction in Icelandic (e.g., "Which fruit is called [Spanish name]?"). The emergence of untrained intraverbal relations was most likely when the antecedent stimuli or target response in the intraverbal trial was similar to that of the trained listener or tact relation. For example, the experimenter presented an  $S^D$  during listener training and the second intraverbal  $S^D$  that contained similar wording (i.e., "Which [fruit or animal] is called [Spanish name]?" during listener training and "What does [Spanish name] mean?" for the Spanish-Icelandic intraverbal). Both participants responded accurately during the intraverbal probe that more closely matched the  $S^D$  presented during listener training. Overall, the results of this study suggested that relations may be more likely to emerge under similar stimulus conditions or when similar responses are required. In clinical practice, the careful arrangement of responses and discriminative stimuli during listener and tact training may facilitate subsequent acquisition of related intraverbal responses; future research on this topic is warranted.

The aforementioned research on emergent verbal behavior suggests that untrained verbal operants occur under some circumstances and not others. An important direction for future research is to identify procedures that more reliably promote generalization across verbal operants, which may facilitate the acquisition of

verbal behavior for children with language delays. Multiple-exemplar instruction (MEI) is one procedure that has produced the emergence of untrained verbal operants (Greer, Yuan, & Gautreaux, 2005; Nuzzolo-Gomez & Greer, 2004; Perez-Gonzalez et al., 2007). MEI involves training a topographically similar response across multiple verbal operants in one teaching session. Greer, Stolfi, Chavez-Brown, and Rivera-Valdes (2005) conducted MEI training with three typically developing preschool children. They taught visual–visual matching relations with an embedded instruction (i.e., the experimenter said the name of the stimulus while the participants matched the stimuli). Next, they probed listener, tact, and impure tact relations (i.e., combining a nonvocal and vocal  $S^D$ ). Following visual–visual matching training, participants emitted untrained listener responses but did not emit tact or impure tact responses. They then taught all four relations for a second set of stimuli using MEI. That is, trials of matching with embedded instruction, listener, tact, and impure tact relations were targeted in one teaching session for each stimulus in the set. One stimulus set originally trained only as a matching relation was probed for the listener, tact, and impure tact relations after MEI. Emergence of untrained listener, tact, and modified tact relations occurred for all participants as a result of an MEI history, although this finding was inconsistent across sets of stimuli. These results are consistent with other recent studies that have demonstrated emergent relations after MEI (Greer et al., 2005; Nuzzolo-Gomez & Greer, 2004).

Multiple-exemplar instruction is a promising procedure that warrants additional investigation to better understand its clinical utility. Although studies have demonstrated emergence of untrained verbal relations after MEI, this finding is sometimes variable or occurs only after extensive training. To date, few studies have examined the emergence of untrained

verbal operants after an MEI history, particularly for children with autism spectrum disorders (Fiorile & Greer, 2007). Moreover, the effectiveness of MEI may rely on already established repertoires that facilitate the emergence of verbal operants. Future research might identify repertoires that are associated with rapid generalization across verbal operants (e.g., self-echoics) after MEI training. This type of research could inform the skills that are assessed and targeted in early intervention programs to maximize learning when MEI is implemented.

Many of the procedures used to study emergent verbal behavior (e.g., stimulus equivalence, MEI) probe untrained verbal operants during extinction to isolate the effects of training on the subsequent emergence of verbal behavior (e.g., Groskreutz, Karsina, Miguel, & Groskreutz, 2010). In clinical practice, the use of extinction to probe emergent verbal behavior may be contraindicated because newly acquired behavior is less likely in the absence of direct reinforcement, particularly for children with developmental disabilities. Given the variable findings in much of the emergent verbal behavior literature, additional clinical research is needed to evaluate stimulus arrangements or procedures that are more likely to evoke untrained verbal operants (LeBlanc, Miguel, Cummings, Goldsmith, & Carr, 2003). In future clinical studies, researchers could conduct baseline and probe sessions using continuous schedules of reinforcement to eliminate the provision of reinforcers as a variable responsible for the emergence of untrained relations.

Another possible avenue of future research involves an examination of the influence of stimulus control on emergent verbal behavior. When evaluating the results of many of the studies in this review, one theme is apparent. Individuals emitted untrained verbal relations more often when the experimenter probed responses under similar stimulus conditions or when they required similar responses. Given the paucity of research in the area of emergent

relations, researchers might consider conducting a more thorough analysis of the role of stimulus control on emergent verbal behavior to identify more effective procedures for evoking untrained relations. Early intervention programs are particularly well suited for conducting this type of research, given that language training is often a primary focus for many children with developmental disabilities.

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