Derived emergence of WH question–answers in children with autism

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A B S T R A C T

Children with autism spectrum disorder often struggle to respond to conversational questions involving words such as "who," "what," and "where." One reason for this may be that answering these types of questions requires a repertoire of relational responding in which the individual must select an answer based on the class memberships of stimuli found in the question. For example, answering the question, "Who do you see at the hospital?" requires identifying a potential response that is in coordination with both "who" and "hospital," e.g., a doctor. The present study sought to examine this premise by providing training designed to promote relational responding to community associations, associations of noun types, and associations between wh- words and noun types. Three participants diagnosed with autism, between the ages of 10 and 12, were exposed to a multi-phase relational training sequence designed to establish equivalence class membership between community helper stimuli, noun-class stimuli, and wh- word relations using protocols from the PEAK Relational Training System (Dixon, 2015. *PEAK relational training system: Equivalence module.* Shawnee Scientific Press: Carbondale, IL; Dixon, in press. *PEAK relational training system: Transformation module.* Shawnee Scientific Press: Carbondale, IL). A concurrent multiple baseline across skills and participants design was used to evaluate the functional relationship between the establishment of these relations and the emergence of correct responding to wh- questions. Results indicated that for two of the three participants, mastery of these relations was functionally related to the emergence of accurate responding to untrained intraverbal wh- questions.

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While no longer a required criterion for a diagnosis of autism spectrum disorder (ASD; American Psychiatric Association, 2013), impairments in language development remain a primary deficit for many diagnosed with ASD. Under previous diagnostic criteria, those diagnosed with ASD were only 47% likely to acquire fluent speech by the age of 4 (Wodka, Mathy, & Kalb, 2013) with as many as 30% of individuals being identified as nonverbal by the age of 9 (Mawhood, Howlin, & Rutter, 2000). Furthermore, individuals diagnosed with ASD perform more poorly on standardized measures of language than typically developing peers (e.g., Condouris, Meyer, & Tager-Flusberg, 2003; Dixon, Belisle, Whiting, & Rowsey, 2014). As noted by Adamson, Romski, and Barton-Hulsey (2014), many individuals with ASD present idiosyncratic language patterns with disturbances in pragmatic usage and understanding, e.g., referential deficits, echolalia, and unusual prosody, as well as abnormal structural characteristics, such as odd meanings and impaired grammar understanding.

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One area in which these abnormalities in structural and pragmatic language can frequently be seen is in the inability to respond to questions that depend on verbal information. Answering questions appears to be a pivotal response class in the development of conversational language (Paul, 1985), yet children with ASD appear less likely to comprehend wh- questions (Goodwin, Fein, & Naigles, 2014). Because of the lack of question-answering abilities in children with ASD, parents and caretakers frequently limit question complexity to questions that can be answered with a "yes" or "no" gesture, thus further reducing meaningful conversations (Goodwin et al., 2014).

Typically developing children are able to learn and interpret wh- questions from their social routines. This can include asking questions such as, "Where is my toy?" to "What is that?" These skills allow children to understand the connections between subjects and objects at a much earlier age than those with ASD. Children with ASD, on the other hand, often rely on memorizing items in specific formats rather than analyzing questions into components and abstracting contextual cues from wh- questions (Goodwin et al., 2014). This reliance on direct contingency learning, as opposed to establishing a generalized operant (cf. Barnes-Holmes & Barnes-Holmes, 2000), makes it even more difficult for those with ASD to learn how to appropriately answer and ask novel wh- questions without resorting to rote memorization.

Several studies have examined possible behavior analytic treatment procedures for teaching wh- questions to children with ASD. Secan, Egel, and Tilly (1989) conducted a study that examined the use of visual prompts to increase correct responding to wh- questions. Participants were read a story and asked wh- questions referring to the content of the book. Participants were then referred to the illustrations of the story to identify the correct answer to the wh- question. Results suggested that participants were able to learn to respond to target questions and maintain the learned skill over time. Furthermore, generalization across various stimuli and persons was demonstrated; however, the visual cue remained a necessary component.

Jahr (2001) taught children with ASD to respond to wh- questions by using a multiple-exemplar strategy to facilitate acquisition and response transfer of full sentences to wh- questions. Wh- questions were categorized by the specific interrogative word used and trained separate from each other. For instance, questions involving "why" were taught first, and only after mastery was reached, did the individual move on to "what" questions. During the session, various wh- questions were directly taught, and upon answering correctly, reinforcement was provided. Corrections and prompts were given if an incorrect response was provided. Once subjects were able to answer these questions, novel questions of the same class were introduced. Results indicated that direct instruction of specific wh- questions was adequate in producing consistent correct responding to both directly trained and novel wh- questions, but only if the format of the novel question was consistent with the trained form. For example, a child trained to respond to questions beginning with, "What do you like to play with?" would only be able to respond to novel questions that also followed the format "What do you like to . . . with?" Additionally, the children were more successful when the expected response form was trained to have structural correspondence between question and answer, e.g., "What do you like to play with?" corresponds with "I like to play with a ball" as opposed to the response, "Balls are my favorite" which does not structurally correspond to the original question.

Discrimination training has also been used with children with ASD to increase the use of wh- questions in making conversation (Doggett, Krasno, Kogel, & Kogel, 2013). Dogget and colleagues taught children the type of noun to which, "who," "what," and "where" typically refer. For example, "who" was taught to be used when asking about people, "where" when asking about a place, and "what" when asking about a thing. Once the context of the word was taught, a conversation probe was presented in which participants were told a statement such as, "I went somewhere today." Participants were then asked, "What can you ask me?" If the correct response was given, "Where did you go today?," reinforcement was provided. Visual prompts of different colors helped individuals answer questions correctly, and it was noted that conversation skills between individuals and peers also increased.

From a traditional behavior analytic perspective, wh- questions are generally conceptualized as a form of intraverbal responding (Skinner, 1957). According to Skinner, intraverbal operants are responses to the verbal behavior of others that do not share formal similarity or point-to-point correspondence. While this definition may describe aspects of the general function and topography of an intraverbal, it does not provide information as to the specific learning history required to produce a generalized repertoire of wh- responding. Skinner specified that an adequate history of reinforcement may yield a repertoire of intraverbal responses, yet he failed to specify what exactly such a learning history would entail. Due to this lack of specification, many behavior analysts have approached intraverbal trainings in the same manner they might a tact, echoic, or textual response, i.e., presenting a specific discriminative stimulus or question followed by a prompt for a specific answer and then providing a generalized reinforcer (Finkel & Williams, 2001; Ingvarsson & Hollobaugh, 2011; Vedora, Meunier, & Mackay, 2009). While approaching language instruction in this way may have led to successful acquisition of basic intraverbal responses, this does not translate well into conversational language. Intraverbal responses in conversation often involve complex discriminative stimuli and responses that may not have been directly taught.

Contemporary behavior analytic approaches, such as those based from relational frame theory (RFT) and stimulus equivalence, instead classify behaviors based on the manner by which one responds to a stimulus in terms of another (Hayes, Barnes-Holmes, & Roche, 2001; Sidman, 1994). For example, the word "cat" can come to evoke similar responding, as would the actual animal, if a sufficient learning history is provided to create a relation between the word and the object. According to these theories, individuals learn to relate stimuli based on formal and verbal qualities, and by doing so, transform the function of the stimulus through its participation with other stimuli. Responding to one stimulus in terms of another is a key principle of stimulus equivalence and RFT and allows for the learning of information across sets of stimuli rather than learning to respond to each individual stimulus (Blackledge, 2003). Relational responding has also been observed to occur