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Using Pivotal Response Training and Technology to Engage Preschoolers With Autism in Conversations

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Abstract

It is well known that children with Autism Spectrum Disorder (ASD) demonstrate a significant delay in language development that impacts their ability to engage in robust conversations (Stevens et al., 2000). In this article the authors discuss two specific elements of Pivotal Response Training: motivations and conversation initiations for preschoolers with ASD. Additionally, the authors identify specific research based intervention strategies used to promote the ability of preschoolers with ASD to ask questions that will enhance their conversations.
It is well known that children with Autism Spectrum Disorder (ASD) demonstrate a significant delay in language development that impacts their ability to engage in robust conversations (Stevens et al., 2000). While the average toddler who understands more than 200 words typically expresses only about 45 words (Fenson et al., 1994), children with ASD demonstrate this level of comprehension only when they can produce an average of 57 to 126 words (Luyster, Kadlec, Carter, & Tager-Flusberg, 2008; Charman, 2004). Thus, young children with ASD understand fewer words than what they can actually produce. However, as a group, children with ASD exhibit substantial delays in language development relative to age-level expectations, show considerable variation in language development, and demonstrate significant delays in receptive and expressive language (Eaves & Ho, 2004; Mitchell et al., 2006; Paul, Chawarska, Chicchetti, & Volkmar, 2008). Of particular concern is the absence of joint attention or the ability to share a mutual gaze towards another person or object. Without joint attention the child with autism struggles to use pragmatic language or the ability to use language to do things such as greeting and parting, requesting, protesting and commenting (Carpenter & Tomasello, 2000). Research also indicates that children with low verbal skills are likely to not be recognized or included in conversations (Kontos & Wilcox-Herzog, 1997). Therefore, intervention must begin as early as possible, when the highest rate of vocabulary growth occurs (Farkas & Beron, 2004) and must employ evidence-based strategies that reduce learning gaps in language development (National Association for the Education of Young Children [NAEYC], 2009).

While limited, some interventions that focus on establishing and maintaining conversations with young children show promise, and suggest that teachers need to spend a significant portion of the day conversing with children. In this article we first define and discuss a research based intervention model known as Pivotal Response Training (PRT) (Koegel &
Koegel, 2006), with specific attention being given to two elements of the model; motivation and self initiations. Next we use a case study (see note at the end of this article) to illustrate specific strategies to teach children with ASD to ask questions. We also provide suggestions for how teachers can use technology to enhance child initiations.

**Pivotal Response Training**

Pivotal response training is a comprehensive intervention delivery model that is based upon a developmental approach to learning and applied behavior analysis procedures (Koegel & Koegel, 2006). PRT provides opportunities for children with ASD to learn within the context of natural environments. The name pivotal response emphasizes the importance of targeting areas of development that will lead to collateral changes in other areas of functioning or responding. Table 1 presents a list of the principles of PRT. Thus pivotal responses once acquired, can lead to widespread improvement in the communicative development of children with ASD. As a comprehensive service delivery model, PRT entails several critical features; early intervention, hours and intensity of intervention, family involvement and natural environments (Koegel & Koegel, 2006). Describing the full components of the program are not within the scope of this article, however, we focus on two functional areas that teachers can use to lay the foundation of PRT and begin to involve students in conversations (See Koegel & Koegel, 2006 for a full description of the PRT model).

**Motivation**

Research in the area of motivation suggests that children with ASD have a significantly difficult time learning the response-reinforcer contingency (Koegel, Carter, & Koegel, 2003). Because children with ASD have lower rates of responding after several unsuccessful attempts to communicate, they can develop a kind of learned helplessness (Seligman, 1972). This
phenomenon effects the later initiation of communicative attempts and can delay the learning of the response-reinforcer contingency. However, researchers indicate that the use of reinforcing techniques and continuous prompting, aids in the reduction of learned helplessness (Koegel & Koegel, 2006). With an increase in successful attempts at communicating, it is likely that the child with ASD will become more motivated to respond in communicative interactions. PRT capitalizes on the variables within the natural environment to increase motivation. For instance, Ms. Jones wants to engage four-year-old Tony, who has ASD, in a conversation. Her first step might be to create a prop box that contains different items related to a theme that are specifically designed to adhere to the Tony's preferences. Ms. Jones designed a prop box especially for Tony and based on his keen interest in sharks. The prop box has several pictures of sharks, plastic toy sharks, and shark stickers. Mrs. Jones uses these props to gain Tony's interest and to increase the likelihood of his attending to a communicative interaction and then to self-initiate a conversation.

**Teaching Children to Enhance Self-initiations**

Successfully initiating a conversation necessitates a state of readiness or motivation and also the ability to establish joint attention with another person. Joint attention is the ability of the child to alternate attention between and object and a communicative partner (Carpenter & Tomasello, 2000). Joint attention can also be viewed as a pivotal response since targeting motivation may increase joint attention which then produces changes in verbal initiations. Ms. Jones sets up the environment to build upon the skills of joint attention and motivation in order to elicit Tony's communicative initiations.

**Conversation Stations**

To set up the environment to establish joint attention and motivation, Ms. Jones constructs a *conversation station*. She places two chairs on opposite sides of a small table in a quiet corner of
the preschool classroom. This might be in the library center or perhaps by her desk. These *conversation stations* provide a space for one-to-one interaction. "In a conversation station the teacher and children actively listen to each other, engaging in purposeful dialogue, designed to expand and develop children’s language," (Bond & Wasik, 2009, p. 467). Now that Ms. Jones has created a space for conversations to begin she takes one item, a shark picture, out of the prop box while keeping the other items in close proximity to her. Placing the picture in front of Tony, she prompts him to attend to the picture with the statement, "Look Tony. It's a shark." This first step involves the establishment of joint attention. What is important to remember is that in this case, joint attention occurs when Ms. Jones visually coordinates attention with Tony to an external focus, showing social engagement and an awareness of the partner’s mutual interest for the purpose of ‘‘commenting’’ rather than ‘‘requesting,’’ (Carpenter & Tomasello, 2000; Mundy & Stella, 2000; Schertz, 2005). Without this critical first step, Ms. Jones cannot engage Tony in a social interaction.

**Commenting on Visual Images**

Next, Ms. Jones places her finger on the picture and states in an excited tone, "It’s a shark. It is swimming in the water." Ms. Jones comments on the picture with enthusiasm to give meaning to the exchange. Giving meaning to the exchange helps Tony focus on important aspects he should pay attention to because they are special in some way (Schertz & Odom, 2007). Children with ASD often respond to irrelevant components of a stimulus rather than the relevant ones. Taking time to point out the relevant stimulus is important for sustaining Tony's interest.

Once gaining Tony's attention, Ms. Jones prompts him to comment on the item within reach saying, "Tell me about the picture, Tony." Ms. Jones waits approximately 3 seconds for
Tony to answer. The use of faster instructional pacing accomplished through brief wait time increases opportunities to respond, student participation, and correct responding for children with ASD (Lamella & Tincani, 2012). When Tony replies, "Shark!" Ms. Jones elaborates on his one word comment adding, “Yes, it's a blue shark. It is swimming in the water.”

While pictures and toy props can be motivating, research findings and clinical observations suggest that young children with ASD tend to be highly attentive to visual content that is electronically delivered (Shane & Albert, 2008). In the following section we discuss the benefits of using technology to enhance conversational language for preschoolers with ASD.

**Technology Use For Children with ASD**

Technology has a long and substantive history and evidence-base in communication interventions for young children with developmental disabilities, autism spectrum disorders (Mirenda, 2001), and complex communication needs (Light & Drager, 2007). As a result of rapid advances in technology, mobile learning via a portable device is increasingly expanding such that learning can occur virtually any time or anywhere. For example, the introduction and increasing popularity of the Apple iPad can be particularly appealing for young learners as it is not only motivating, but also provides opportunities for self-initiation. Further, the iPad includes many features that are potentially useful, including the capability to run applications (apps) (Marturana, 2012).

Fifty-eight percent of the 25 top selling educational apps target toddlers/preschool children (Shuler, 2012), demonstrating the perceived potential of apps as educational tools by teachers. Apps have the potential to target a wide array of functional skills necessary for effective communication including joint attention, turn-taking, vocabulary development, increasing length and complexity of language, and pre-literacy skills (DeCurtis & Ferrer, 2011).
iPad apps can be useful when working with children with ASD as some allow for individualization based upon interests or preferences, and provide varied opportunities to teach and/or support specific skills sets across naturally occurring routines and activities.

Teachers will want to select apps that focus on a skill or set of skills that a child may be lacking, or need additional motivation to acquire. For example, if a child with ASD is working on understanding emotions, the app *Emotions* may be a great one to try. Conversely, if a child is working on receptive and/or expressive language, the app *Speech Tree* will provide opportunities to work on one word concepts like nouns or verbs. Many of the applications can be customized, including one emotion per page instead of multiple ones (e.g. *Emotions*), while others provide corrective feedback (e.g. *Speech Tree*), allowing children with varying abilities to feel successful. Other apps, such as *I Can Write I*, provide animation when a sentence is formed correctly, which can be very motivating for child with ASD. Table 2 provides a list of several examples of quality apps, targeting language development, that will help to not only stimulate motivation on the part of the child, but also provide a framework for developing initiation skills. The following section will discuss a specific app, *Book Writer*, including suggestions on how it can be implemented and adapted for individual students.

**Book Writer**

The Book Writer application allows for the creation of different kinds of books for example, photo, video, art, and cooking. The books can also be enhanced by including videos and/or music, and a person can record their own voice directly into the book which can be easily activated with a touch. Finally, the photos can be manipulated by the user, again by touch, including moving, enlarging, reducing, and rotating. Each photo represents a “page” that can be turned, similar to reading a book in print. These features allow for more interaction, and thus,
more interest by the user. Multiple books can be created and saved within this application, allowing the teacher to access a variety of books with relative ease.

This app can be adapted for use with Tony and other children with ASD, such that various verbal initiations are targeted, and opportunities for practicing the skill are embedded into the naturally occurring routines of the day. For example pictures and or videos could be included in Book Writer that are designed to practice skills such as eliciting attention, requesting assistance, or seeking play partners. Ms. Jones will want to increase the child’s motivation by providing preferred or favorite pictures or videos. To target requesting assistance, for example, Ms. Jones could take one picture of a favorite toy that is out of reach and another of a child playing with that favorite toy, including both in the app. Ms. Jones will want to provide several trials where she prompts the child with the statement, “Help me,” while looking at the picture of the toy out of reach. Upon initiating the statement the child can then flip to the next picture that shows them actually playing with the toy. Ms. Jones may even take a short video of the child playing with the toy to put in place of the still picture. During center time, she can then direct the child to the area of the classroom where the toy is out of reach, and prompt the child by asking, “Do you want the toy?” If the child replies with the statement “Help me,” they are able to play with the preferred item. In keeping with the principles of PRT, a communicative attempt should result in immediate access to the item. Therefore, if the child responds with just the word “Help,” the item should be provided to him.

If the child shows interest in another item that may be out of reach or otherwise inaccessible, the teacher can follow their lead and respond accordingly if the child provides the necessary verbal initiation. Ms. Jones may also consider intentionally setting up opportunities for the child with ASD to solicit help from a peer, or providing pictures or videos of preferred
activities (utilizing the same procedures as discussed above) but contingent upon them asking a peer to “Play” before being allowed access to the activity. While initiating a conversation can be established by using a single word, more complex language can be generated when a child is able to ask a question of others. In the next section we focus on teaching children with ASD to ask Wh-questions to initiate and enhance language acquisition.

**Teaching Children with ASD to Ask Wh-Questions**

Asking and understanding questions is important to becoming a competent communicator, and to help individuals learn more about their environment. Unfortunately, children with ASD are described as having significantly impaired communication skills and do not learn to ask questions from simple exposure as do typically developing children (Jahr, 2001; Prelock, 2007). But how does one teach a child to ask a question? Let's return to Ms. Jones and examine the specific procedures that she employs to guide Tony in asking a question, including suggestions for how iPad app technology can be embedded to further enhance this skill.

**Teaching: "What is it?"

**Motivation.** In starting the initial conversation with Tony, Ms. Jones will want to have several interesting toys at hand. But this time she will put the toys in a small cotton cloth bag where they are only partially visible. Using toys that light up, vibrate, or emit sounds ensures that the objects will stimulate Tony's natural curiosity. Ms. Jones realizes that because Tony does not know how to ask wh-questions, she will likely have to prompt him with a model.

**Prompting.** Without Tony noticing, Ms. Jones places one vibrating toy into the bag and places it within sight, but out of Tony's reach. When Tony attends to the noise in the bag, Ms. Jones models, “What is it?” and waits 3 seconds. When Tony does not respond, she opens the bag and shows him the vibrating frog. She exclaims, "It's a frog. It's a shaking green frog."
Rather than giving the frog to Tony, she places it in a box behind her. If she gives the frog to Tony, the prompt could be interpreted as a request for the toy rather than for information (Ostryn & Wolfe, 2011). Ms. Jones wants to teach Tony to request information by using the "what" question.

**Provide information.** Ms. Jones continues to guide Tony’s attention to the bag each time with a different toy and models the question, "What is it?" When Tony elicits the question after several trials, Ms. Jones provides information about the object. Then she allows Tony to hold the object for 10 seconds as a reinforcer. In the last stage, Ms. Jones places the object in the bag and waits for Tony to ask, "What is it?" She responds with information describing the object for Tony using new vocabulary words. If Tony does not respond, Ms. Jones can prompt Tony requesting him to say, "What?" using the question inflection and an exaggerated tone of voice. Any approximation of the word is acceptable for gaining visual access to the toy. Teaching the "What is it?" question allows Tony the flexibility to initiate conversations on his own with others, and provides more information about his environment.

**Embed Technology.** Given Tony’s preferences for sharks and frogs, Ms. Jones can include pictures and/or videos that revolve around these themes within the Book Writer application. She can also voice record prompts and/or questions that Tony can independently activate by touching a picture. Ms. Jones may want to start simple and build complexity as Tony becomes more comfortable with the iPad app, and is able to attend to it for extended periods of time. For example, Ms. Jones may begin by including a single picture of a frog hopping between lily pads. She will model the question, “What’s that?” and then show him that when she touches the picture, a voice recording says, “It’s a frog.” After several trials, she can prompt Tony to ask, “What’s that?” and allow him to touch the screen upon asking the question. She can encourage
Tony to rotate, enlarge, and reduce the picture, while talking with him about the changes he sees. As Tony enlarges or reduces a picture while saying the word “Frog”, Ms. Jones may say, “Look that frog got bigger”, or “That frog got smaller.” Or if Tony rotates the picture, Ms. Jones may say, “Oh my goodness, that frog is upside down.”

Because the “What is it?” question format naturally involves Tony's toy preferences, he may very likely move towards requesting the object. Ms. Jones can now build on this requesting behavior to teach Tony to ask where questions.

**Teaching: "Where is _____?"

**Motivation.** As in the previous training routine, Ms. Jones selects one of Tony's preferred items and places it in a container. When Tony attends to the object, Ms. Jones says, "Tony get your ______." Tony is permitted to reach inside the container and take the object, playing with it for 5 seconds. Ms. Jones requests the item back and has her aide covertly place the item in another container a few feet away from Tony.

**Provide opportunities.** She shows the empty container to Tony and repeats, "Tony, get your _____”. If Tony does not ask "Where is the _____?" Ms. Jones provides verbal prompts to elicit the question, "Where is the _____?" When Tony asks the question, Ms. Jones tells him that it is in the blue box on the table and points towards it. Tony is permitted to retrieve the item and play with it for 20 seconds. Ms. Jones continues the game until Tony initiates the conversation with "Where is the ______"?

Researchers have found that children with autism were able to discriminate between what and where questions using this technique (Ostryn & Wolfe, 2011) but they did emphasize that the training consisted of 20 trials. Thus, teachers must be patient and consistent in using these strategies to gain the best outcomes for young children with ASD.
**Generalization.** Ms. Jones will want to conduct similar exercises to work with Tony throughout the day, using a similar naturalistic intervention. She will deliberately construct opportunities for Tony to ask the *What* and *Where* questioning format by hiding objects and requesting that Tony retrieve objects that are not visible to him. Because Ms. Jones is the primary language teacher for Tony, it may follow that Tony directs all conversation to Ms. Jones. Researchers have noted that children with language impairments often direct their speech to adults rather than to their peers (Rice, Alexander, & Hadley, 1993). So, just as we want Tony to generalize his questions in different contexts, we also want him to engage in conversations with his peers. Ms. Jones uses incidental teaching episodes in the classroom to help this take place. When Tony asks Ms. Jones, "Where is my coat?" Ms. Jones redirects Tony to a peer. This allows Tony to bridge the gap in initiating informational conversations to adults and peers.

**Embed Technology.** As Tony progresses in his skills Ms. Jones may consider adding pictures, familiar and unfamiliar, to allow for more practice asking “What’s that?” eventually building up to including pictures that allow Tony to practice asking, “Where is it?” She may even consider switching the prompts so the question is voice recorded (e.g. “What’s this?”) and the response is provided by the child (e.g. “It’s a frog”). While Tony is used here as an illustrative example, the magnitude and pacing of these changes will be dependent upon the individual child and their current skills and abilities.

**Final Thoughts**

In this article we focus on providing strategies for teachers as they work to develop the communication skills of preschool children with ASD. Specifically, we suggest using a PRT model focused on two specific areas of functioning, motivation and communicative self-initiations, followed by recommendations for employing this model in teaching children to ask questions and utilizing technology to enhance initiations. Preschool teachers can embed these
strategies into their naturally occurring routines to help children become more successful in building their repertoire of language and ultimately, engage more frequently in conversation with adults and peers.

*Note: The situation under which the vignette depicting Tony and Ms. Jones was developed is a fictionalized account drawn from several authentic situations and put together as an aggregated scenario.*
References


Table 1

*Principles of Pivotal Response Training*

- Children are engaged in the preschool classroom that is arranged with preferred items and activities of interest.

- The teacher follows the child's lead to allow him/her to become interested in a particular stimulus (i.e. toy, activity, or person).

- The teacher prompts the student or another peer to ask the child with ASD about the stimulus (e.g., "Do you want the shark?").

- When the child with ASD attempts to respond verbally, the preferred object is given to the child immediately (Koegel & Koegel, 2006).
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<td>Simple nouns are targeted</td>
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<td>Promotes book reading</td>
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<td>Action words</td>
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<td>Talking ginger</td>
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<td>Allows children to record their voice</td>
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