Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorder: A Pilot Study

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Autism Spectrum Disorder (ASD) is characterized by persistent deficits in social communication and social interaction. These challenges persist into adulthood, which can lead to poor outcomes in postsecondary education, employment, and independent living. Social skills are learned behaviors that are socially acceptable, enabling an individual to interact effectively with others. They are critical for academic, work, and life outcomes. Although social skills can be taught, the majority of evidence-based practices addressing social skills deficits have only been tested with young children with ASD. As such, there is an urgent need to test the use of evidence-based practices to teach social skills with older students with ASD.

Pivotal Response Treatment (PRT) is an evidence-based practice that has been used to improve the social and communication skills of children with ASD. However, it has primarily been implemented with young children with ASD and in the clinical setting. This concurrent multiple baseline design study across dyads investigated the use of PRT in the secondary school setting with adolescents with ASD. Specifically, it examined the impact of PRT on one particular aspect of social interaction: question-asking. Education providers \((n = 3)\) were trained to implement PRT with a secondary student with whom they already worked one-on-one. To participate in the study, students had to (a) have a diagnosis of ASD, (b) have an IQ of \(50 – 100\), (c) at minimum speak in simple sentences, (d) be enrolled in a public secondary school, (e) be
aged 14–21 years, and (f) be identified by their teacher as having difficulty independently asking basic questions.

Results of the study found no functional relation between Education Provider-implemented PRT and targeted question-asking behavior (i.e., questions beginning with *who*, *what*, or *where*) in secondary students with ASD. In part, this finding was attributed to lack of fidelity of implementation: only one of three education providers was able to achieve the criterion level for fidelity of PRT implementation. Nonetheless, two of the students exhibited clear effects with noteworthy improvement in their use of targeted question initiations. Implications for practice and research, limitations, and directions for future research are discussed.
Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorder: A Pilot Study

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Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorder: A Pilot Study

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Chapter 1

Introduction

For individuals with Autism Spectrum Disorder (ASD), challenges with social communication and relationships persist into adulthood (Howlin, Moss, Savage, & Rutter, 2013; VanBergeijk, Klin, & Volkmar, 2008). Difficulty with social skills can hinder transition to higher education and employment, areas in which people with ASD have poor outcomes (e.g., Newman et al., 2011). As such, there is an immediate need to develop and test ways to teach social skills to high school students with ASD. Question asking is a skill with which many people with ASD struggle. Self-initiation behaviors such as question asking are important because they can help individuals seek help when needed, engage in conversation with others, and develop vocabulary (Kearsley, 1976; L.K. Koegel, Koegel, Harrower, & Carter, 1999).

Pivotal Response Treatment (PRT) is an evidence-based behavioral treatment; many studies have supported its effectiveness in improving the social and communication skills of children with ASD, including question asking (e.g., L. K. Koegel, Carter, & Koegel, 2003; L. K. Koegel et al., 1999; R. L. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). However, PRT is primarily implemented with young children and in the clinical setting. There is an urgent need to make evidence-based practices, such as PRT, available to adolescents and young adults with ASD through school programs (Stahmer, Collings, & Palinkas, 2005). This study begins to address this need by investigating whether education providers (i.e., teachers, paraprofessionals) can be trained to implement PRT with fidelity in the secondary school setting, resulting in an increase in question asking by their student with ASD. This study helps to bring evidence-based practices into the school setting, making them available to more students with ASD. Additionally, it expands understanding of whether one specific evidence-based practice (i.e.,
PRT) may work with secondary students with ASD. It will also help to address the urgent need for interventions to teach social and communication skills to adolescents with ASD.

**Background of the Problem**

The increase in prevalence of ASD has necessitated continued emphasis on the development and evaluation of interventions to teach critical skills to individuals with ASD. The prevalence rate of ASD has been increasing steadily over time (Centers for Disease Control and Prevention, 2016). Today, approximately one in 68 children has been identified with ASD according to the Centers for Disease Control and Prevention’s Autism and Developmental Disabilities Monitoring Network (Christensen et al., 2016). Much research has, by necessity, focused on interventions for infants and young children with ASD; the importance of early intervention for children with ASD cannot be overstated (Dawson et al., 2010; Reichow, 2012).

However, children with ASD grow into adolescents and young adults with ASD. With age comes new challenges and experiences (Volkmar, Reichow, & McPartland, 2014). This is particularly true in the social arena. As individuals age, their social relationships become more complex and varied (Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006; Berscheid, Snyder, and Omoto, 1989). For individuals with ASD who already struggle with social skills, this complexity can create a particularly difficult adolescent experience (Odom, Duda, Kucharczyk, Cox, & Stabel, 2014). Research has demonstrated that challenges with social communication and relationships persist into adulthood (Howlin et al., 2013; VanBergeijk, Klin, & Volkmar, 2008). Difficulty with social skills can hinder transition to higher education and employment, areas in which people with ASD have poor outcomes (e.g., Newman et al., 2011). Social skills are critical for success in higher education and employment (Casner-Lotto, Barrington, & Wright, 2006; Farrington, et al., 2012; Jerald, 2009). This is problematic for individuals with ASD because a
core feature of ASD diagnosis is difficulty with social communication and social interaction (American Psychiatric Association, 2013).

Surprisingly little is known about individuals with ASD as they age (Howlin & Moss, 2012; Volkmar, Reichow, & McPartland, 2014). However, what is known suggests the importance of developing ways to improve adult outcomes. As described in more detail in Chapter 2, adults with ASD are often socially isolated and have low rates of employment and participation in postsecondary education (Howlin, Moss, Savage, & Rutter, 2013; Newman et al., 2011). Despite these poor outcomes, little research has focused on addressing related areas of concern – such as social skills – in young adults with ASD.

Importantly, evidence-based practices for teaching social skills to individuals with ASD do exist. PRT is an evidence-based behavioral treatment that fosters social communication skill development by capitalizing on an individual’s natural motivations (R. L. Koegel & Koegel, 2012). Extensive research has demonstrated the efficacy of PRT in promoting language and social communication development in children with ASD (Coolican et al., 2010; Hardan et al., 2014; Ventola et al., 2014; Wong et al., 2014). Prior research has found that PRT can be used to successfully teach question asking to children with ASD (R. L. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014; Verschuur, Huskens, Verhoeven, & Didden, 2017). Question asking serves an important role in reciprocal conversation -- an area of challenge for many people with ASD (Laugeson & Ellingsen, 2014; Paul et al., 2004). While few studies have examined the effects of PRT on adolescents/young adults with ASD, initial research has yielded promising results (Koegel & Frea, 1993).

However, an evidence-based practice is only evidence-based if it is used with the population on which and in the setting in which it has been tested. For a practice to be considered
evidence based, it must be defined within a clearly described context because practices cannot be expected to yield benefits for all individuals under all conditions (Horner et al., 2005). It cannot be assumed that the efficacy of an evidence-based practice will generalize from one setting or one population to another; rather, the results must be replicated in these new settings and/or with different groups of students (Schmidt, 2009). Therefore, it is critical that evidence-based practices such as PRT be tested with new populations to determine their efficacy, particularly with adolescents with ASD and in the high school setting. This study expands the literature by testing an established evidence-based practice (i.e., PRT) in a novel setting with a new population: adolescents with ASD in a high school setting.

Adolescence is a complex period of human development during which many social, cognitive, and physical changes occur (American Psychological Association, 2013; Susman & Rogol, 2004). Importantly for this study, it is a period of dramatic social change in which social relationships—particularly with peers—take on more importance than they previously had (American Psychological Association; Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006; Berscheid, Snyder, and Omoto, 1989). The importance of social interaction at this time may make it a particularly challenging period for people who struggle with social skills, such as those with ASD (Odom, Duda, Kucharczyk, Cox, & Stabel, 2014). Because adolescence is such a unique phase of development, it cannot be assumed that a person at this time of life will respond to an intervention in the same way that they might at the elementary level. As such, it is imperative to test evidence-based practices such as PRT with adolescents, as well as younger children.

It is also important to test PRT in the high school setting. In general, most studies on PRT have taken place in the clinical setting and very little research on PRT has taken place in schools.
A systematic literature review of PRT implementation in schools identified only 13 studies (Kowitt et al., in preparation). While the number of studies is small, the results are encouraging: overall, they suggest that paraprofessionals and teachers can be trained to implement PRT with fidelity, resulting in positive outcomes for elementary students with ASD. Recently, for example, Brock, Dueker, and Barczak (2017) found that education providers (i.e., teachers and paraprofessionals) could be trained to implement PRT at recess, resulting in significant increases in interactions among students with ASD (ages 10-12 years) and their peers. However, no school-based studies of PRT have taken place at the high school level (Kowitt et al.). To be considered an evidence-based practice in high schools, PRT must be tested and found effective in this setting as well. High schools are unique environments that vary greatly from their elementary counterparts. These differences include focus on advanced academics, the developmental phase of the student body (i.e., adolescence), large buildings and student populations, specialized and separate professional functions, differences in instructional approach across disciplines, and often a zero-tolerance disciplinary policy (Bohanon, Fenning, Borgmeier, Flannery, & Malloy, 2009; Flannery, Frank, Kato, Doren, & Fenning, 2013; Freeman et al., 2018; Skiba & Rausch, 2006). In 2018, Freeman et al. implemented a study replicating in a high school, targeted professional development for classroom management procedures that had been established at the elementary level. The failure of this replication is an important reminder that it is necessary to test evidence-based practices in the high school setting, and not to assume they will work because they have done so in elementary schools. The “urgent call” put out by Freeman and colleagues regarding replication at the high school level, while written about classroom management practices specifically, applies to all evidence based practices (p. 155). Given the strong evidence base supporting PRT, one important direction for research would be to
test further implementation of PRT in the school setting, particularly the secondary school setting.

Adolescents with ASD struggle with social interaction and require intervention to improve their social skills, which have a direct relation to positive adult outcomes overall. Evidence-based practices, such as PRT, that have been found to improve the social skills of students with ASD have not been tested with older students. Therefore, it is imperative that the repertoire of available evidence-based practices for use with adolescents with ASD be expanded. One potentially efficient way to tackle this problem would be to test in a secondary setting the use of extant evidence-based practices that have been found effective with elementary students with ASD.

**Purpose of the Study, Research Questions, and Hypotheses**

The purpose of this study was to test the use of PRT in the secondary school setting. Specifically, there were two main goals to this study. First, this study evaluated secondary education providers’ ability to implement PRT with fidelity following a PRT training program. Second, the study sought to evaluate the effects of school-implemented PRT on the social communication skills of adolescents and young adults with ASD. Specifically, the question-asking behavior of participating secondary students with ASD was measured. Thus, the primary and secondary research questions for this study were:

1. What is the effect of school-implemented PRT on target social communication goals in secondary students with ASD, specifically question-asking?
2. Can education providers at the secondary level (e.g., special education teachers, paraprofessionals, job coaches) be trained to implement PRT with fidelity?
Based on previous studies examining PRT implementation in the school setting, it was hypothesized that while participating education providers would not use PRT strategies prior to training, they would reach fidelity of implementation within a short time of completing training. In addition, it was hypothesized that at baseline, target students would use few questions in their interactions with education providers. It was predicted that this number would increase following intervention.

This study is significant because it seeks to begin to address the research gap in the area of social skills interventions for adolescents with ASD. Additionally, by bringing an evidence-based practice into the school setting, it addresses a need for more school-based interventions for students with ASD. Evidence-based practices, such as PRT, that teach social skills to students with ASD are too infrequently incorporated into school programs (Stahmer, Collings, & Palinkas, 2005). Typically, PRT is only available in the clinical setting, which may limit access to the intervention. Making PRT available to more students in the school setting increases its impact on a wider range of students in need.

**Research Design**

This study used a multiple baseline design across three dyads (i.e., education provider-student pairs). The study took place in two high schools in the northeast United States. Two paraprofessionals and one special education teacher participated as education providers. To participate in the study, the education provider had to be currently working in a public 9-12th grade high school, a transition program housed within the school, or an external transition program run by the local education agency. The education provider had to be working currently with students with ASD aged 14–21 years. To participate in the study, students had to: (a) have a diagnosis of ASD, (b) have an IQ of 50–100, (c) at minimum speak in simple sentences, (d) be
enrolled in a public secondary school, (e) be aged 14–21 years, and (f) be identified by their teacher as having difficulty independently asking basic questions (e.g., unprompted questions and relevant who, what, and where questions). The diagnosis of ASD was established based on the student’s Individualized Education Program (IEP). Students had to be working with an education provider who had already agreed to participate in the study. At the start of data collection, the student participants ranged in age from 14 to 19 years.

The dependent variable for the study was student question-asking behavior, specifically questions beginning with target stems (i.e., who, what, and where). A secondary dependent variable was untargeted question initiations (i.e., all other question types). The independent variable for the study was education provider implementation of PRT. Dyads were video/audio recorded at baseline working together as they usually would. After the education provider received training in PRT, the education provider implemented PRT with the student during audio/video-recorded sessions. All video/audio recordings were coded for the education provider’s fidelity of implementation and for student question-asking behaviors. In addition, education providers completed a social validity survey at the completion of the study.

**Dissertation Organization**

The dissertation is organized into five chapters. Chapter Two of this dissertation presents an in-depth review of the pertinent literature. It further describes the poor outcomes seen in adults with ASD and explicates the importance of social skills in the areas of employment, postsecondary education, and quality of life. In addition, it introduces the evidence supporting PRT, and in particular, outlines the research regarding its implementation in schools. Chapter Three provides a detailed description of the methods of the single case design study. It introduces the participants, setting, procedures, instruments, and dependent variables. Study results are
presented in Chapter Four, which describes the visual analysis of the data. Implications, directions for future research, and study limitations are discussed in Chapter Five.
Autism Spectrum Disorder (ASD) is a developmental disability that affects approximately one in 68 children in the United States (Christensen et al., 2016). ASD is characterized by persistent deficits in social communication and interaction across contexts, resulting in significant impairment in social and educational arenas. According to the American Psychiatric Association, the diagnostic criteria for ASD include (a) persistent and global deficits in social communication and social interaction; (b) restricted, repetitive patterns of behavior and interests; and (c) symptoms causing significant challenges in social, occupational, and/or other important areas of current functioning (American Psychiatric Association, 2013). Challenges in social communication and interaction may include deficits in social-emotional reciprocity (e.g., reciprocal conversation, failure to initiate or respond to social interactions); challenges with understanding and expressing nonverbal communicative behaviors (e.g., facial expression, body language); and struggles forming, maintaining, and understanding relationships (American Psychiatric Association).

These challenges with social interaction and communication, coupled with restricted and often fixated interests and behaviors, can manifest as overall social skills deficits. Social skills are “socially acceptable learned behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses” (Gresham & Elliott, 1990, p. 1). More specifically, social skills and competencies include social communication, problem solving, decision-making, self-management, and peer relations (U.S. Department of Education, 2013). Michelson, Sugai, Wood, and Kazdin (1983) provide further detail in their list of necessary components making up social skills. Of particular relevance to this study, their definition emphasizes that social skills (a)
involve effective, appropriate initiations and responses; (b) maximize social reinforcement; (c) are interactive and include effective, appropriate responsiveness; and (d) are dependent on age and context. As previously noted, for many people with ASD, social skills deficits can include difficulties in use and comprehension of nonverbal communication, failure to engage in conversational turn-taking, and deficits in sharing and comprehending abstract information (Mason, Rispoli, Ganz, Boles, & Orr, 2012).

One particular area of social challenge for many people with ASD is question asking. Question asking has been long understood to play several important functions in social conversation, including sustaining interactions and avoiding awkward pauses between conversing individuals (Kearsley 1976). Indeed, questions are at the very heart of conversational dialogue, which is made up of a set of initiations, such as questions, followed by responses to those initiations (Doggett, Krasno, Koegel, & Koegel, 2013). There is even some evidence that people who ask more questions in conversation are better liked than those who ask fewer (Huang, Yeomans, Brooks, Minson, & Gino, 2017). However, from an early age, individuals with ASD present relatively few initiations, including questions (Stone & Caro-Martinez, 1990; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Taylor & Harris, 1995). The absence of initiated questions by people with ASD has been observed to persist across the lifespan (R. L. Koegel & Koegel, 2012). The lack of question asking presents a critical challenge for many people with ASD due to the important functions the behavior serves in human interaction.

Given that social skills are primarily learned behaviors and that challenges with social skills, including question asking, are a prominent characteristic of ASD, it is not surprising that instruction in social skills is often a priority for educators of students with ASD. Practice guidelines for educators have stressed the importance of targeting social skills with intervention
(e.g., Connecticut State Department of Education, 2011; National Research Council, 2001). The National Autism Center (2015) cites interpersonal skills as one of the developmental skill areas that educators of students with ASD should consider targeting. Researchers have developed and evaluated a range of options for improving social skills for children with ASD; however, the majority of these focused on improving social skills only for young children. For example, Reichow and Volkmar (2010) identified and analyzed 66 studies published from 2001 – 2008 testing interventions to improve social behavior in people with ASD, of which only three had all adolescent and adult participants. In addition, they found that researchers examined a small range of intervention types (i.e., only video modeling and ABA-based interventions) in these studies with older participants. Camargo and colleagues (2016) analyzed single case design studies examining behaviorally based interventions for teaching social interaction skills to children with ASD in inclusive educational settings. Of the 19 studies they identified as meeting minimum standards of quality single-case research, only one study involved participants over age 11 years. Another review of studies investigating the efficacy of social skills groups for people with ASD found only two rigorous studies that included young adults in the sample (Reichow, Steiner, & Volkmar, 2013). Clearly, there is a need for studies testing interventions to improve social skills in adolescents with ASD. As will be discussed, social skills become particularly important and complex in adolescence, presenting further challenges for teens with ASD. In addition, social skills are critical for academic, work, and life outcomes, and difficulty with social skills can hinder transition to higher education and the workplace (Farrington, et al., 2012). This need is particularly critical given the poor employment, educational, and independent living outcomes for adults with ASD, described below.
Adult Outcomes for Individuals with ASD

The few studies examining adult outcomes for individuals with ASD have reported bleak findings in the areas of independent living, postsecondary education, and employment.

**Independent living.** Few adults with ASD live independently. In a review of outcome studies published 2000–2011, Howlin and Moss (2012) found that the average percentage of adults with ASD assessed as (a) having good or very good outcomes or (b) living independently or semi-independently was below 20%. Similarly, Newman et al. (2011) found that only 17% of young adults with ASD who had graduated high school within the past eight years were living independently. Regardless of their residential situation, adults with ASD were often reliant on others for support in daily living (Howlin, Moss, Savage, & Rutter, 2013). Indeed, research suggests that functional skills and quality of life may even decline throughout adulthood for people with ASD (Interagency Autism Coordinating Committee, 2012).

**Postsecondary education.** In general, adolescents and adults with ASD have poor outcomes as related to postsecondary education (Howlin et al., 2013). This was also true as compared to their peers with other disabilities. For example, although on average 60% of young adults with disabilities received some postsecondary education within 8 years after graduating from high school, this was true for only 43.9% for young adults with ASD (Newman et al., 2011). Students with learning disabilities, speech/language impairment, emotional disturbance, traumatic brain injury, and deaf-blindness were all more likely to receive postsecondary education than were students with ASD (Newman et al.). For those students who did enroll in postsecondary education, completion rates were low; within 8 years of leaving high school, completion rates from most recent postsecondary schools was 38.8% (Newman et al.). While a completion rate of 38.8% is problematic on its own, it is noteworthy that this percentage is low
even as compared with peers with other disabilities; for example, within 8 years of leaving high school, the completion rate for students with hearing impairments was 52.9% (Newman et al.).

**Employment.** Young adults with ASD have the lowest rates of participation in employment of all students with disabilities (Newman et al., 2011, Shattuck et al., 2012). Shattuck et al. (2012) found that over 50% of youth with ASD who had left high school in the past two years had no participation in employment or further education. One study found that only 63.2% of young adults with ASD had been employed at any time within eight years of graduating from high school (Newman et al.). Ninety-one percent of these recent graduates had a salary of $25,000 or less. Of individuals with autism who utilized vocational rehabilitation services, only 40.8% were employed by the time their cases were closed (Cimera & Cowan, 2009). On average, unemployed recent high school graduates with ASD had the longest job searches (12.3 months) of students in any disability category (Newman et al.).

Given the poor outcomes for adults with ASD in the areas of independent living, employment, and postsecondary education, more information is needed about ways to help adolescents with ASD develop critical skills to improve their adult outcomes. Social skills are necessary for positive academic, work, and quality of life outcomes (Farrington, et al., 2012). Unfortunately, there is very little evidence for effective interventions for adults with ASD, including those to improve social skills (Howlin & Moss, 2012). As such, more interventions are needed that have the potential to help people with ASD prepare for life during adolescence and into adulthood.

**The Impact of Social Skills Deficits in Adolescence and Across the Lifespan**

Adolescence is a period of human development during which major cognitive and social developments take place. For example, during this phase, most adolescents improve in their
ability to think abstractly, consider events from multiple points of view, and self-reflect (American Psychological Association, 2013). Adolescence is a highly social period, with an emphasis on social acceptance, an increased importance placed on peers, and an increase in participation in activities with peers (American Psychological Association). As such, challenges with social skills may make adolescence a particularly difficult time for people with ASD.

Odom, Duda, Kucharczyk, Cox, and Stabel (2014) posited that the combination of the developmental period of adolescence, social challenges inherent in ASD, and the structure of high schools generates “a ‘perfect storm’ of complexity, which creates challenges for accomplishing positive post-school outcomes” for students with ASD (p. 124). While childhood is dominated by familial relationships, peer relationships begin to play an increasingly important role for most adolescents (Parker, Rubin, Erath, Wojlawowicz, & Buskirk, 2006; Berscheid, Snyder, and Omoto, 1989). However, as their peers’ lives are increasingly dominated by friendships, students with ASD continue to struggle with social relationships. Adolescents with ASD experience more loneliness than their typically developing peers (Locke, Ishijima, Kasari, & London, 2010). Locke et al. (2010) found that while students with ASD had friendships that were similar in many ways to those of their typically developing peers, they had significantly poorer friendship quality in terms of companionship and helpfulness. In teens with ASD, social skills deficits, combined with physiological hyperarousal (e.g., trembling hands, shortness of breath, racing heart) have been found to be significant predictors of social anxiety, which may further hinder the ability to form social relationships (Bellini, 2006). Given the importance of social interaction in adolescence, intervention must be in place to help those students with ASD who are struggling with social skills and are therefore experiencing difficulty forming and maintaining relationships.
For most people with ASD, challenges with social communication and relationships persist into adulthood. Of people diagnosed with ASD in childhood, 70 - 80% will continue to have marked social impairment in adulthood, and there is evidence of decline in social functioning over the lifespan (Howlin et al., 2013; VanBergeijk, Klin, & Volkmar, 2008). Social skills are critical for academic, work, and life outcomes, and difficulty with social skills can hinder transition to higher education and the workplace (Farrington, et al., 2012). Research suggests that twenty-first century employers require workers who communicate effectively and solve problems collaboratively (Casner-Lotto, Barrington, & Wright, 2006; Jerald, 2009). Indeed, interpersonal engagement is a critical component of college and career readiness (Morningstar, Lombardi, Fowler, & Test, 2017). It is not surprising then that social skills performance has been found to be a stronger predictor of positive adult outcomes for people with ASD than even IQ (Howlin, Moss, Savage, & Rutter, 2013). As stated above, students with ASD have low rates of participation in postsecondary education (Newman et al., 2011). If a student is able to receive acceptance to college, difficulty with social skills may make it challenging to succeed and persist to graduation; social skills deficits make it hard for students to navigate new settings and develop relationships, decreasing the likelihood of postsecondary success (Mason et al., 2012).

Finally, challenges with social interaction can also impact the mental health of adolescents and adults with ASD. Lack of understanding of social rules often results in interpersonal rejection and exclusion from groups (Lawrence, Alleckson, & Bjoklund, 2010). Although many adolescents and adults with ASD want friends, the majority report having none (Hendricks & Wehman, 2009). A review of recent studies about adult outcomes for people with ASD found that only 25% of participants reported having at least one friend (Howlin & Moss,
Only about half of recent high school graduates with ASD report seeing friends outside of school or work at least weekly, less than any other disability category (Newman et al., 2011). Subsequently, adults with ASD report high levels of loneliness, depression, and anxiety (VanBergeijk et al., 2008). Repeated social failure and low self-esteem may contribute to depressive symptoms (Lawrence, Alleckson, & Bjoklund, 2010).

Clearly, social skills are critical for successful transition to employment and postsecondary education. They are also necessary for forming relationships that can mitigate feelings of loneliness and depression and improve quality of life. However, adolescents and adults with ASD struggle with social skills, negatively impacting many aspects of their lives. Fortunately, research suggests that social skills can be taught, however most of the research into how to teach social skills has targeted children with ASD, rather than adolescents and young adults.

Social Skills Instruction for Students with ASD

As the research above clearly indicates, interventions are needed to teach social skills to people with ASD beyond the early childhood years. Research indicates that social skills deficits persist across the lifespan (VanBergeijk et al., 2008) and so children with ASD must continue to receive social skills instruction as they age into adolescence. Instruction and intervention to improve these skills is necessary, with the hope of improving possibilities for employment, higher education, and positive quality of life over time. Fortunately, social skills are malleable and can be taught. For example, the National Autism Center (2015) concluded that Social Skills Intervention packages had a high-quality research backing and sufficient evidence “for us to confidently state that they are effective” (p. 41). Reichow and Volkmar (2010) conducted a “best evidence synthesis” of interventions to increase the social behavior of individuals with ASD.
They concluded that there is much supporting evidence for the effective treatment of the social challenges found in ASD. However, these studies are almost entirely focused on how to teach social skills to children – rather than adolescents or young adults -- with ASD.

Interventions to teach social skills to teenagers with ASD are necessary because the social challenges individuals face and the social skills needed to address them are age- and context-specific (Carter et al., 2014; Michelson, Sugai, Wood, and Kazdin, 1983; Roth, Gillis, & Reed, 2014). As students age, they experience new social environments, including work and college. They also experience new relationship types such as romantic relationships and relationships with supervisors and co-workers. Behaviors considered appropriate in youth may not be appropriate in adolescence and, ultimately, adulthood. Social skills are further complicated for adolescents with ASD by the problem of generalization. Individuals with ASD struggle with generalizing concepts from one setting to another. Early researchers into the field of ASD identified generalization as a challenge for children with ASD (Rimland, 1964). For example, a student may learn to engage in appropriate eye contact when eating dinner with his family, but this may not translate to use of the same skill when playing a board game with a peer. Difficulty with generalization makes the instruction of social skills even more challenging as students may not associate a new skill learned with a new setting. Likewise, the presentation of autistic symptoms changes as an individual progresses through developmental stages (National Autism Center, 2011). A person may receive excellent social skills instruction in elementary school, but these learned behaviors may not serve an individual well over time. For example, social skills training in elementary school may emphasize sharing toys, which would not be a priority in later life. Similarly, appropriate behavior changes based on environment; what is appropriate in an elementary school setting may not be appropriate in high school.
and efficient place to begin the search for much-needed evidence-based interventions for teens with ASD would be to test effective social skills interventions that exist for children with ASD.

**Pivotal Response Treatment**

Pivotal Response Treatment or Training (PRT) is a scientifically-based behavioral intervention that provides opportunities for learning within the context of the child with ASD’s natural activities and environment (R. L. Koegel & Koegel, 2006). PRT is based on the principles of Applied Behavior Analysis (ABA) and relies on antecedent strategies and reinforcement to change behavior. It also prioritizes generalization. R. L. Koegel and Koegel (2006) wrote “the primary goals of PRT are to move individuals with autism toward a typical developmental trajectory by targeting a broad number of behaviors and providing children with autism the opportunity to lead meaningful lives in natural, inclusive settings” (p. 4). PRT is considered an evidence-based practice by the National Professional Development Center on Autism Spectrum Disorder (Wong et al., 2015). It is one of the 11 treatments categorized as “established” – the highest rating – by the National Autism Center National Standards Project (2015). In a review of 33 practices used with students with ASD, it is one of only four identified as a “scientifically based practice” (Simpson, 2005). However, in a recent review, What Works Clearinghouse (WWC) identified only two studies of PRT that met WWC group design standards without reservations (no studies met standards with reservations) and three single-case design studies that met pilot WWC standards without reservations (one study met standards with reservations). Based on these studies, WWC concluded that PRT was found to have no discernible effects on communication/language outcomes for children with ASD (United States Department of Education, 2016). The results of the WWC review emphasize the need for more high-quality research examining the effects of PRT.
PRT is most distinguished from ABA by its emphasis on targeting solely pivotal behaviors. A pivotal behavior is defined as “a behavior that, when learned, produces corresponding modifications or covariation in other untrained behaviors” (Cooper, Heron, & Heward, 2007, p. 701). For example, self-initiation is considered a pivotal behavior for children with ASD because improvement in this behavior also leads to improvements in vocabulary and language development (R. L. Koegel & Koegel, 2012). Originally called the Natural Language Paradigm (NLP; R. L. Koegel, O’Dell, & Koegel, 1987), PRT was developed to address concerns in discrete trial training, which is perhaps the better-known and more commonly used form of ABA. Discrete trial training is often criticized for its indiscriminate selection of target behaviors (R. L. Koegel & Koegel, 2012). Rather than seeking to change any behavior, PRT addresses only pivotal behaviors, improvements in which will perpetuate further opportunities for learning and reinforcement. Another key distinction is the emphasis on intervention taking place in the natural environment or within the context of typical activities. For example, the clinician will set up opportunities to elicit target behaviors while playing games with the child and parents are often trained to implement PRT at home.

Researchers have identified the following pivotal behaviors for children with ASD: motivation, responsivity to multiple cues, self-initiations, and self-management (R. L. Koegel & Koegel, 2006; L. K. Koegel, Koegel, Harrower, & Carter, 1999). Each is described in more detail below.

**Motivation.** Motivation in PRT has a different meaning than in classic ABA. In ABA, motivation is most often considered in reference to motivating operations, which are contextual variables that affect (a) the reinforcing or punishing effectiveness of a stimulus, and (b) the frequency of behavior reinforced or punished by that stimulus (Cooper, Heron, & Heward, 2007;
In contrast, in PRT, motivation is synonymous with responsivity to social cues. In their foundational article about PRT, L. K. Koegel, Koegel, Harrower, and Carter (1999) wrote that “an improvement in motivation is broadly defined as an increase in responsiveness to social and environmental stimuli” (p. 178). In the context of PRT, motivation refers to observable behaviors, including increases in the number of responses a child makes to teaching stimuli, decreases in response latency, and changes in affect (e.g., improvements in interest, enthusiasm, or happiness; L. K. Koegel et al.). As such, PRT relies on motivational variables to increase the target child’s likelihood to respond. Incorporating motivational variables increases a child’s motivation to engage in social communication and to try to learn other tasks (R. L. Koegel & Koegel, 2012).

**Responsivity to multiple cues.** Many children with ASD display “stimulus overselectivity,” in which a person responds to limited (and often irrelevant) components of their environment (Lovaas, Schreibman, Koegel, & Rehm, 1971). PRT addresses this challenge by arranging the learning activity around conditional discriminations (i.e., one that requires a response based on multiple cues; L. K. Koegel, Koegel, Harrower, & Carter, 1999). Research shows that by consistently providing this type of instruction, children with ASD can eventually learn to respond correctly to multiple cues (L. K. Koegel, Koegel, Harrower, & Carter).

Responsivity to multiple cues is considered a pivotal area because an ability to respond to multiple cues enhances learning and positively impacts several areas (L.K. Koegel, Koegel, Harrower, & Carter, 1999). For example, a child who is not able to respond to multiple cues can identify crayons, but may not be able to select the green crayon from a box of crayons when prompted. In contrast, a child who is able to respond to multiple cues can go through a box of crayons to select the green one, thereby responding to both the object and color cues. Being able
to respond to multiple cues may improve a child’s ability to respond to complex structured and social stimuli (Burke & Cerniglia, 1990). Ability to respond to multiple cues may be particularly important in learning complex, context-specific social behaviors through observation (L.K. Koegel et al.).

**Self-initiations.** Self-initiation involves an individual beginning a new verbal or nonverbal social interaction, or instigating a behavior that results in interaction (L.K. Koegel et al., 1999). It may include question-asking and help-seeking behaviors. Multiple studies have found that PRT can be used to increase the number of questions asked by children with ASD (e.g., L. K. Koegel, Carter, & Koegel, 2003; L. K. Koegel, Koegel, Green-Hopkins, & Barnes, 2010). Self-initiation is a pivotal behavior because it creates opportunities for spontaneous learning opportunities across contexts and in natural environments, without the need for an intermediary (L.K. Koegel et al.). For example, L. K. Koegel, Carter, and Koegel (2003) found that teaching self-initiations (in this case, teaching children with ASD to ask a specific question) resulted in the improvement of other verbal skills, including increases in mean length of utterance, number of questions asked, total number of verbs used, and diversity of verbs used. In another study, researchers taught students to use the question “Where is it?,” which resulted in the additional learning of correct corresponding language structures (L. K. Koegel, Koegel, Green-Hopkins, & Barnes, 2010).

**Self-management.** Self-management places the responsibility of behavior management with the student, rather than the service provider. It is defined as an individual selecting and self-initiating their own appropriate behavior, and then self-reinforcing or recruiting reinforcement for that behavior (L.K. Koegel et al., 1999). Once mastered, self-management can be used to learn an infinite number of subsequent behaviors, making it a pivotal behavior (L.K. Koegel et
al.). Self-management has been shown to positively affect a range of behaviors, including conversational turn-taking in teenagers with ASD (Doggett, 2013; L.K. Koegel et al.).

**PRT strategies.** In addition to the emphasis on pivotal behaviors, there are five other key differences between PRT and discrete trial training: selection of stimulus item, style of interaction, environment, reinforcement criteria, and reinforcement type (R. L. Koegel & Koegel, 2012). First, in discrete trial training, the stimulus item is selected by the clinician and is repeated until the criterion for success is met. Flashcards, for example, are common stimulus items in discrete trial training. In contrast, one principle of PRT is “child choice”: the clinician uses child-preferred or child-selected materials, topics of conversation, or toys. For example, in PRT, a student may select to do a craft project. In this scenario, the discriminative stimulus is the availability of craft supplies, the desired behavior is requesting the supplies, and the positive reinforcer is the receipt of the necessary supplies to continue work on the project. Activities are varied regularly, and the clinician prompts the child to attempt a combination of both maintenance (learned) and acquisition (new) tasks. Second, regarding the style of interaction, in discrete trial training, the stimulus is not used purposefully and/or is not related to the interaction (e.g., flashcards). In PRT, the clinician and child play together with the stimulus, and the stimulus serves a purpose within the interaction (e.g., craft supplies when working on a craft project together). Third, in discrete trial training, the procedures are implemented within a structured setting, while in PRT the procedures take place within the context of naturally occurring activities. Fourth, discrete trial training and PRT differ in the child responses that are reinforced. Unless the clinician is implementing a shaping program, in discrete trial training, only correct responses are reinforced. However, in PRT, reasonable attempts that are clear and goal-oriented are also reinforced. Finally, the two procedures differ regarding the type of
reinforcement. While both rely on contingent reinforcement, in discrete trial training, reinforcers are arbitrary (e.g., edibles), but PRT uses natural reinforcers (e.g., opportunities to interact with the preferred stimulus item).

The strategies used in PRT are aligned with these five key differences and the pivotal areas (R. L. Koegel & Koegel, 2012). Research has repeatedly found certain strategies to be important in effectively addressing the motivation pivotal behavior in children with ASD (L.K. Koegel et al., 1999) and these strategies form the basis for PRT implementation. There are eight PRT strategies: child attending, clear opportunity, interspersal of maintenance and acquisition tasks, multiple cues, child choice, contingent reinforcement, natural reinforcement, and reinforcement of attempts (R. L. Koegel & Koegel, 2006). See Appendix A for definitions and examples of the strategies. Child choice, natural reinforcers, interspersing maintenance trials, and reinforcing attempts are also considered motivational variables (L.K. Koegel, Koegel, Harrower, & Carter, 1999). The implementer should use each of the eight strategies during each opportunity to respond when conducting PRT.

**PRT Implementation in Schools**

PRT is considered an evidence-based practice that has positive effects on social communication and behavior in students with ASD. Given the strong evidence-base supporting PRT, one important area of research is implementation of PRT in the school setting. Kowitt et al. (in preparation) conducted a systematic literature review to identify and analyze existing literature about PRT implementation in the school setting. They identified 13 studies in which PRT was implemented in the school setting; for details about each of the studies included in the literature review, see Appendix B. They then analyzed these studies for (a) study methodology
used, (b) characteristics of students with ASD receiving PRT, (c) person implementing PRT, (d) setting for implementation, and (e) dependent variables.

Figure 1. Proportion of studies in Kowitt et al. (in preparation) literature review by methodology.

Of the 13 studies, the majority ($k = 9$) used a single case design, in particular multiple baseline across participants; the remainder used a quasi-experimental approach (Figure 1). PRT was implemented in a range of locations across the schools, most frequently on the playground or in an empty classroom (Figure 2). As a common goal of PRT is to improve social communication, it was surprising that only one study examined its implementation in a highly social aspect of the school day: lunchtime. In three studies, an outside researcher conducted PRT in an empty room at the student’s school (e.g., classroom, resource room; Lydon, Healy, & Leader, 2011; Stahmer, 1995; Thorp, Stahmer, & Schreibman, 1995). In these cases, the school acted as a convenience location for the setting of the study. While PRT was conducted in the school setting, it was not integrated with any existing aspect of the school environment (e.g., personnel, activity) and thus the study itself provided little to no information about the possibility
of implementing PRT in schools. In contrast, in one study (L. K. Koegel, Kuriakose, Singh, & Koegel, 2012), outside researchers implemented PRT during recess to increase socialization between target students with ASD and their peers.

*Figure 2.* Frequency of PRT implementation settings in studies included in the literature review by Kowitt et al. (in preparation). Some studies took place in more than one setting and were therefore counted more than once.

Because early intervention has been found to be critical for long-term outcomes for students with ASD, PRT was originally designed with young children in mind (R. L. Koegel & Koegel, 2006). Therefore, it was not surprising to find that studies about PRT implementation in the school setting have only used elementary-aged samples. The oldest student to receive PRT as part of these studies was 10 years, though the average age of participants was 6.58 years. These
results highlight the need for studies that examine PRT implementation for older students, particularly in the school setting. Indeed, across all of the studies analyzed as part of this systematic literature review on PRT ($k = 56$), regardless of implementation setting, no study had participants older than 17 years. Only one study included participants in the 15- to 17-year-old range (R. L. Koegel & Frea, 1993) and only three included participants in the 11- to 14-year-old range (R. L. Koegel & Frea; Mohammadzaheri, Koegel, Rezaee, & Rafiee, 2014; Schreibman, Kaneko, & Koegel, 1991). Clearly, there is a need to examine PRT for older students. Given PRT’s emphasis on an individual’s interests and the selection of individualized target behaviors within the pivotal behavior areas, it could potentially be adapted to suit the needs of older students with ASD.

Figure 3. Proportion of studies included in Kowitt et al. (in preparation) literature review by person implementing PRT.
A range of people implemented PRT across the 13 studies (Figure 3), including peers \((k = 4)\), teachers \((k = 3)\), paraprofessionals \((k = 2)\), and researchers \((k = 4)\). Particularly noteworthy for expanding access to PRT through its implementation in the school setting were studies in which people already part of the school community received training in PRT. Studies demonstrated that paraprofessionals, teachers, and peers could all be trained to implement PRT with fidelity, resulting in increases in a range of desired behaviors in target students with ASD.

As mentioned above, a range of people already part of the school community can be trained to implement PRT with fidelity. However, some strategies (i.e., turn-taking, narrating play, and multiple cues) were more challenging to master than others. On the whole, the studies provided very little information about how much time is needed to train school-based implementers to fidelity. Two studies that provided training until criterion for fidelity was met found very different results (from an average of under two hours to over seven). While only the studies about paraprofessionals looked at satisfaction with training and the intervention, the feedback was very positive. This is important because positive feelings about the intervention make it more likely that the implementer will continue to use it once the researcher is no longer present. Research exploring the importance of “acceptability” of interventions has consistently found that a teacher’s perception of an intervention’s general acceptability and the time required to implement are the two critical factors that determine if they would consider using the intervention (Elliot, 2017).

PRT implementation in schools may have positive effects on a range of dependent variables, including reciprocal social behavior, self-initiations, play, and student affect. Reciprocal social behavior was the most frequently included dependent variable. Five of the eight studies (62%) that reported outcomes in this area found either a functional relation or
positive effects. As such, the use of PRT in schools to improve reciprocal social behavior in students with ASD is a promising area of future research. Although eight studies examined the effects of PRT on self-initiations, limitations in study design made it impossible to determine if there was a functional relation. Additionally, study limitations and unclear results reporting made it impossible to determine effects in four of the eight studies. However, in three of the remaining four studies, there were demonstrated effects between PRT and self-initiation and there were no non-effects.

Rationale for Study and Research Questions

There is a proven need to develop ways to teach social skills to high school students with ASD. ASD is characterized by persistent deficits in social communication and interaction (American Psychiatric Association, 2013). These challenges persist across the lifespan, which can lead to poor adult outcomes in postsecondary education, employment, mental health, and independent living. Social skills are learned behaviors that are socially acceptable, enabling an individual to interact effectively with others (Gresham & Elliott, 1990). They are critical for academic, work, and life outcomes (Farrington, et al., 2012). Although social skills can be taught, the majority of evidence-based practices addressing social skills deficits have only been tested with young children with ASD (Reichow, Steiner, & Volkmar, 2013; Reichow & Volkmar, 2010).

Young adults with ASD may have had social skills training as children; however, these skills may no longer be age-appropriate and may not directly translate to the secondary education environment. Poor outcomes for adults with ASD indicate the necessity for social skills intervention that continues into adulthood. There is an urgent need to develop and test ways to teach social skills to high school students with ASD.
PRT is an evidence-based practice that has been found to have positive effects on a range of desired social behaviors for people with ASD. Typically, PRT is only available in the clinical setting, which may limit access to the intervention. Evidence-based practices, such as PRT, that teach social skills to students with ASD are too infrequently incorporated into school programs (Stahmer, Collings, & Palinkas, 2005). To make PRT available to a wider range of people with ASD, PRT could be implemented in the school setting. As a review of the literature shows, PRT can be effectively implemented in the elementary school setting. Specifically, teachers and paraprofessionals can use PRT to target critical social communication and behavior areas in their students with ASD. PRT can be implemented in a range of school settings to match the needs of individual students and structures of the individual schools. Teachers and paraprofessionals can learn to implement PRT with fidelity in a relatively short amount of time. While few studies have examined the social validity of PRT implementation in schools, those that have found positive results. With a wide range of possible effective implementers and settings, PRT may be easily implemented in the school setting, expanding access to an effective social skills intervention for students with ASD.

However, given that PRT has not been studied with older students with ASD, it would be worthwhile to extend the age-range of participants to test its implementation in the secondary school setting. With PRT’s emphasis on an individual’s interests and the selection of individualized target behaviors within the pivotal behavior areas, it could potentially be adapted to suit the needs of older students with ASD. Thus, the purpose of the current study was to test PRT implementation in the secondary school setting. The primary and secondary research questions for this study were:
1. What is the effect of school-implemented PRT on target social communication and social behavior goals in secondary students with ASD, specifically question asking?

2. Can education providers at the secondary level (e.g., special education teachers, paraprofessionals) be trained to implement PRT with fidelity?
Chapter 3
Methods and Procedures

Research Design

In keeping with prior research on school-implemented PRT, this study used single case design (e.g., Feldman & Matos, 2013; Harper, Symon, & Frea, 2008; L. K. Koegel, Kuriakose, Singh, & Koegel, 2012; Pierce & Schreibman, 1995). Specifically, a concurrent multiple baseline design across participant dyads (i.e., pairs consisting of an education provider and a student) was used. In this kind of design, introduction of the intervention is staggered across participants over time, and comparisons are made within and between phases, within and across participants (Kratochwill et al., 2010).

Single case design is particularly appropriate for special education research. Specifically, Horner et al. (2005) underscore the importance of this research for the field of special education because of its emphasis on (a) the individual student, (b) active intervention, and (c) practical procedures that can be used in typical settings. Three education provider-student pairs participated in the study. A multiple baseline design with three participant pairs provides opportunity for three demonstrations of change and thus meets the methodological standards for single-case design experiments (Horner et al., 2005; Kratochwill et al., 2010).

The procedures for the multiple baseline design study consisted of three phases: baseline, education provider training, and intervention. The initial research design included plans for a follow-up phase in which maintenance data would be collected. However, this phase was not completed as the intervention phase for one of the participant pairs did not conclude until the final day of the academic year.
Materials

Implementing PRT requires the use of motivating materials that are of interest to the target student. These may include board games, craft projects, and ingredients for cooking. To assess each student’s interests in order to provide relevant materials, the principal investigator (a) interviewed students about their preferred activities, hobbies, and interests and (b) interviewed education providers to learn more about the student’s preferences. The researcher provided necessary materials (e.g., board games) for the school. These were donated to the school at the completion of the study. The materials used by each student are outlined in their descriptions below.

Settings and Participants

Settings. The study took place in the school in which participating students with ASD were currently enrolled. For recruitment purposes, this could include a typical 9-12th grade public high school, a transition program housed within the school, or an external transition program run by the local education agency. Ultimately, the study took place in a rural high school and in a transition program run by the local education agency, which was located outside of the high school. PRT took place within the student’s typical instructional settings within the school. In the Student Participants section that follows, detailed information is provided about each of the settings in which the student was enrolled and in which the study took place.

Education providers. Three education providers were recruited for the study. Recruitment procedures are described in the following Procedures section. For the purposes of this study, “education providers” could include full-time or part-time special education teachers, paraprofessionals, teaching assistants, or job coaches. To be eligible to participate in the study, an education provider had to currently work in a public 9-12th grade high school, a transition
program housed within the school, or an external transition program run by the local education agency. The education provider also had to work currently with at least one student with a diagnosis of ASD aged 14–21 years. As described later in this chapter, each education provider received training in and implemented PRT with an assigned student, with whom they worked for the duration of the study.

**Education Provider 1.** Education Provider 1 was a 49-year-old Caucasian male working as a paraprofessional in a transition program. He had held his current position for about 5 years. Prior experience working with students with disabilities included substitute teaching. He had his M.A. in education with a focus on working with secondary students, and a B.A. in English and Social Studies. He did not have any formal training in Applied Behavior Analysis (ABA), or PRT specifically.

**Education Provider 2.** Education Provider 2 was a 29-year-old, female, Caucasian special education teacher in a rural high school, where she had been working for the past 5 years. She had her M.A. and B.A. in special education. She had eleven years of experience working with students with disabilities having worked as a paraprofessional prior to pursuing her degree. She had some experience with ABA, having worked at an ABA-based school as a paraprofessional. She reported that her training in ABA was primarily “on-the-job,” though she had taken one related workshop. She reported currently using some components of ABA in her own teaching. She had no prior experience with or training in PRT.

**Education Provider 3.** Education Provider 3 was a 46-year-old, female, Caucasian paraprofessional working in a rural high school. She had worked as a paraprofessional for a total of 7 years. She had her B.A. in arts fields. As a paraprofessional, her training had mostly been on-the-job, although each year she received three days of professional development on some
aspect of special education. Although she had no prior experience with PRT, she reported some informal experience with ABA while working as a paraprofessional in an elementary school program.

**Student participants.** Each enrolled education provider worked one-on-one with a student for the duration of the study. To participate in the study, a student had to meet the following criteria: (a) have a diagnosis of Autism Spectrum Disorder, (b) have an IQ of 50 – 100, (c) at minimum speaks in simple sentences, (d) be enrolled in a public secondary school, (e) be aged 14–21 years, and (f) be identified by their teacher as having difficulty independently asking basic questions (e.g., unprompted questions and relevant who, what, and where questions). To participate, a student also had to work with an education provider who had agreed to participate in the study. The diagnosis of ASD was established based on review of the student’s Individualized Education Program (IEP). IQ scores were taken from students’ extant school files. Levels of speech were confirmed based on teacher report.

**Student 1.** At the start of data collection, Student 1 was 19 years old. He worked with Education Provider 1 for the duration of the study. His primary diagnosis on his IEP was Autism. He had a full-scale IQ of 58 on the Wechsler Intelligence Scale for Children - Fourth Edition (WISC-IV; Wechsler, 2003). Student 1’s special education teacher had completed the Teacher Rating Form of the Vineland Adaptive Behavior Scales, 2nd Edition (VABS-II; Sparrow, Cicchetti, & Balla, 2005). According to the VABS-II Teacher Rating Form, his adaptive use of communication and his daily function were in the mild deficit range and his socialization score fell in the moderately low range; overall his adaptive functioning level was in the mild deficit range. He received below average scores on the Peabody Picture Vocabulary Test – Fourth
Edition (PPVT-4; Dunn & Dunn, 2007) and on the Expressive Vocabulary Test – Second Edition (EVT-2; Williams, 2007).

Student 1 received his education in a fulltime transition program run by the local education agency. This transition program served a small group of students (fewer than 20) with a range of disabilities, including ASD. It was located in a rural setting. Job experience was a priority for the program and students volunteered, interned, or worked in local businesses. Students’ schedules were individualized and were structured around job site commitments. When not at their job sites, students received instruction in academic content areas (e.g., history), life skills (e.g., hygiene, interviewing), and social skills.

The school facility consisted of two large main classrooms; a small, private classroom down the hall; recreational common spaces; and a kitchen adjacent to the main classroom, which was used by the school for educational purposes. Video/audio recorded sessions with Pair 1 (i.e., Student 1 and Education Provider 1) took place in the regular classroom; the small, private classroom; a public seating area adjacent to the main classroom; or the kitchen.

According to his teachers, Student 1’s interests were music, cooking, board games, and taking walks. At baseline, Student 1 and Education Provider 1 engaged in the activities that they would typically do together during the school day, all of which were of Student 1’s choosing. These included cooking, conversing about or conducting online research on topics selected by the student, and preparing for his driving exam. During the intervention phase, Pair 1 continued to engage in conversations on topics of Student 1’s choosing. They also played a range of games together. These included building a marble run and playing a “Memory” card game. The memory game cards focused on musicians and bands and were designed specifically to correspond with Student 1’s interest in music. Pair 1 also played a barrier game in which each participant had
their own Mr. Potato Head toy to work with. Education Provider 1 would create a Mr. Potato Head figure that was concealed from Student 1. Student 1 then tried to replicate it by asking questions to learn about what Education Provider 1’s Mr. Potato Head looked like. Then the roles were reversed and Student 1 created a Mr. Potato Head that was to be replicated by Education Provider 1.

**Student 2.** At the start of data collection, Student 2 was 18 years old. He worked with Education Provider 2 for the duration of the study. Student 2 attended a rural public high school where he spent 50% of his time in a resource room setting. His primary diagnosis on his IEP was Autism. Student 2’s cognitive functioning had been previously assessed using the Wechsler Adult Intelligence Scale–Fourth Edition (WAIS–IV; Wechsler, 2008); he had a full scale IQ of 73 on the WAIS-IV. His oral language score on the Woodcock-Johnson Tests of Cognitive Abilities – 3rd Edition (Woodcock, McGrew, & Mather, 2001) was in the very low to low range. Based on the results of the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999), Student 2 struggled in the areas of requesting pertinent information and requesting clarification.

Student 2’s rural public high school was part of a district in which 88.9% of students were Caucasian, 3.8% were African American, and 3.0% were Hispanic/Latino. District-wide, 1.3% of students were English Language Learners, 13.6% of students were students with disabilities, and 49.6% were eligible for free or reduced-price meals. All of the video/audio recordings for Pair 2 (i.e., Student 2 and Education Provider 2) took place in the resource room where Student 2 and Education Provider 2 typically met.

According to his special education teacher, parent, and IEP documentation, Student 2’s interests included comic books, exercising, checkers, drawing, and video games. During the
baseline phase, Pair 2 worked exclusively on academic tasks, all of which were selected by Education Provider 2 and were not aligned with Student 2’s preferences/interests. For example, during one baseline session, Pair 2 took turns reading from a worksheet about different diseases and then completed a set of associated comprehension questions. During intervention, Pair 2 played a range of games together, all of the student’s choosing. Materials for these games included a Checkers board game, a Chinese Checkers board game, two Mr. Potato Head sets (to play the barrier game described above), a “Jenga” game, activity cards including directions for different exercises, and the board game “Trouble.”

**Student 3.** At the start of data collection, Student 3 was 14-years-old. He worked with Education Provider 3 for the duration of the study. Student 3 received his education in the same rural public school as Student 2 (described above). He spent one-third of his time at school with non-disabled peers and rest of the time in a special education classroom. His primary diagnosis on his IEP was Autism. His standard score on the WISC-IV was a 58.

Student 3’s interests included puzzles, Legos, exercising, and drawing. During baseline, Pair 3 participated in a range of activities available in the classroom, all of which were of Student 3’s choice. These included playing board games, building with Legos, doing exercises based on an online workout video, the game “Simon,” and a circuit board activity. Student 3 continued to select some these activities during the intervention phase (e.g., Legos, board games). Other materials provided and used during the intervention phase were two Mr. Potato Head sets (for the barrier activity described above) and a Checkers board game.

For the audio/video recorded sessions for this study, Pair 3 (i.e., Student 3 and Education Provider 3) met in their typical self-contained classroom; a small, private classroom adjacent to the regular classroom; the school library; or a private classroom in the school library.
**Independent Variable**

The independent variable was the PRT provided by the education provider to the student. As part of this study, education providers received training in PRT (see Procedures section below). Following the last baseline session, the education provider implemented PRT with the target student over two phases: the video feedback phase and the intervention phase. Each of the three sessions making up the video feedback phase consisted of two parts. First, the education provider read a script for a mini-lesson introducing the target question stem for that day (i.e., who, what, and where). Second, the education provider led a PRT session. During the video feedback phase, the principal investigator automatically provided performance feedback following the session, which incorporated video from that day. During the intervention phase, each education provider implemented PRT with their student. In this phase, the education provider received performance feedback only when their fidelity of implementation fell below the 80% criterion for fidelity.

Video coders (i.e., the principal investigator and a secondary coder) coded each session for the education provider’s fidelity of PRT implementation. The first 15 minutes of PRT implementation were coded. Fidelity was defined as demonstrating each of the PRT components (i.e., child choice, child attending, clear opportunity, contingent reinforcement, natural reinforcement, reinforcement of attempts, and interspersion of maintenance/acquisition tasks; see Appendix A) in 80% of opportunities (R. L. Koegel & Koegel, 2006; Ventola et al., 2014). The adapted version of the standard PRT fidelity of implementation scoring sheet was used to code for fidelity (Appendix C; R. L. Koegel & Koegel). This version was adapted to (a) be age-appropriate for adolescents (i.e., the implementer is not required to incorporate the multiple cues strategy), and (b) to calculate fidelity by opportunity, rather than per minute. In the coding sheet,
each line corresponds with a single opportunity or prompt, each of which is subsequently coded for inclusion of each of the PRT strategies. For the purposes of this study, an opportunity was defined as (a) a direct question; (b) a declarative utterance; (c) a new, discrete comment; (d) or three or more seconds of wait time. Appendix D includes more detail about how opportunity was defined for the purposes of this study, as well as examples and non-examples.

The scoring for the PRT Fidelity of Implementation Scoring Sheet (Appendix C) was dichotomous; the education provider received a checkmark if they demonstrated a PRT component and a minus if they did not. If the education provider implemented all seven PRT components in a given opportunity, then the opportunity was determined to have been executed with fidelity. For each session, percent of opportunities with fidelity of implementation was calculated as the number of opportunities executed with fidelity divided by the total number of opportunities, multiplied by 100.

Dependent Variables

A member of the research team video/audio recorded all sessions. The principal investigator coded the first 15 minutes of all recordings from each phase of the study. In addition, a secondary coder also code 31.75% of the videos (see Reliability section below). Each session was coded for both of the dependent variables. The primary dependent variable for the study was student use of targeted question initiations. The secondary dependent variable for students was use of untargeted question initiations.

**Targeted question initiations.** Video coders (i.e., the principal investigator and the secondary coder) counted the total number of targeted questions asked by the student within the 15 minutes of video. To be considered a target question initiation, the student had to ask a question that (a) began with one of the three target stems (i.e., who, what, or where), (b) made
sense given the context of the interaction, and (c) was not modeled by the implementer. Student self-corrections were counted as correct use of a targeted question initiation. For examples and non-examples, see Appendix E. The coding sheet used to code for all student dependent variables was based on a coding sheet by Simonsen and Freeman (2013; Appendix F).

**Untargeted question initiations.** Video coders recorded the total number of novel, untargeted questions posed by the student within the recorded 15 minutes to evaluate general improvements in the skill of question-asking (R. K. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). Untargeted Question Initiations included question types not taught as part of the intervention (i.e., questions that do not begin with who, what, and where) and that made sense given the context of the interaction. For example, if the student and implementer worked on a craft project together and the student asked “How did you do that?,“ then this question was considered an untargeted question initiation. In contrast, if given the same scenario, the student asked “what did you do?” or “do you like cheeseburgers?,“ these questions were not counted as untargeted question initiations because they began with a taught stem or were off-topic, respectively.

**Other Data Collection**

In addition to the aforementioned dependent variables, social validity and demographic data were also collected. Both are described below.

**Social validity.** Social validity deals with participants’ perceptions of the importance of target behaviors and the acceptability of intervention procedures (Cooper, Heron, & Heward, 2007; Wolf, 1978). In his seminal article, Wolf (1978) stressed that research participants must validate the “social significance of goals,” “the social appropriateness of the procedures,” and “the social importance of the effects” (Wolf, 1978, p. 207). As such, this study solicited feedback
from education providers about their satisfaction with and perceptions of the training they received. Data collection on implementer satisfaction with the training and intervention took place in a similar manner to previous studies about school-implemented PRT (Feldman & Matos, 2013; Robinson, 2011). At the completion of the study, education providers completed a survey to learn more about their opinions on the training package and the intervention overall. The survey included both Likert-type scale questions and open-ended questions (Appendix G).

**Demographic information.** In addition to the above dependent variables, demographic information was also collected about the education providers and students. For the education providers, this included: age, current title, level of training, years in current position, years working with students with disabilities, experience with ABA and PRT, sex, race, and ethnicity. Each education provider was interviewed to gather this information. A review of the student’s file was conducted to collect the following demographic information: age, sex, race, ethnicity, educational placement, grade level, experience with ABA and PRT, IQ, and results from other diagnostic testing available in the student’s school records (e.g., Vineland Adaptive Behavior Scale scores). Demographic information for education providers and students is presented in the Participants section above.

**Reliability**

In keeping with the What Works Clearinghouse single-case design standards (Kratochwill et al., 2010), inter-observer agreement (IOA) was calculated for each participant dyad at each phase for at least twenty percent of the data points. Specifically for this study, IOA was calculated for every third video. Overall, IOA was calculated for 31.75% of total sessions (i.e., 31.58% of baseline sessions, 33.33% of video feedback training sessions, and 31.25% of intervention sessions). IOA was calculated for dependent variables and PRT fidelity.
A secondary coder was trained to code video recordings for dependent variables and PRT fidelity. Training consisted of two parts. At the initial meeting, the secondary coder was introduced to the definitions for each dependent variable and each PRT strategy, as well as examples and non-examples. She received a handout detailing the definitions and examples (Appendices E and H). The data collection forms (Appendices C and F) were also introduced. The primary investigator and the secondary coder practiced using the forms while watching a video of PRT implementation. The principal investigator and the secondary coder continued to code videos of PRT being implemented until the secondary coder reached the predetermined criterion for IOA (i.e., 85% IOA). In sum, training took place over five sessions.

As stated above, the secondary coder coded 31.75% of the total number of video recorded sessions. IOA between the principal investigator and the secondary coder had to be 80% or higher – the traditional level of acceptable agreement (Kazdin, 2011). If IOA fell below 80%, the principal investigator and the secondary coder reviewed operational definitions together. They coded additional videos of PRT implementation until a criterion of 85% inter-rater reliability was reached and before resumption of coding PRT sessions.

For the independent variable (i.e., fidelity of implementation per opportunity), IOA was computed using trial-by-trial IOA, calculated using the following formula (Cooper, Heron, & Heward, 2007):

\[
\text{Trial–by–trial IOA} = \left( \frac{\text{Number of trials with agreement}}{\text{Total number of trials}} \right) \times 100.
\]

For student behaviors, IOA was computed using the mean count-per-interval method, which involves (a) dividing the observation session into smaller intervals, (b) recording the total number of occurrences of the target behavior within each interval, (c) calculating agreement between two coders by interval, and (d) summing these agreements, dividing them by the
number of intervals, and multiplying by 100. Mean count–per–interval IOA was calculated using the following formula (Cooper, Heron, & Heward):

\[
\text{Mean count–per–interval IOA \%} = \frac{\text{Int}_{1\text{IOA}}+\text{Int}_{2\text{IOA}}+\text{Int}_{N\text{IOA}}}{n\ \text{intervals}} \times 100.
\]

**Procedures**

This study used a multiple baseline design across dyads (i.e., education provider-student pairs). This section outlines the following study procedures and phases: recruitment, desensitization period, baseline, education provider training in PRT, intervention phase, and follow-up.

**Recruitment.** Education providers were recruited first. The principals at the two participating high schools granted permission to recruit education providers from their schools. At one school, the principal investigator worked with the head of special education to arrange an information session to introduce the study to all special education providers at the school. Following this information session, education providers were given a form (see Appendix I) through which they could express interest in participating in the study and provide their contact information. At the other school, the principal investigator worked through a supervising special education teacher to connect with interested education providers.

The principal investigator then met individually with all education providers who expressed interest in learning more about the study. These meetings consisted of answering questions about the study and explaining the consent form (Appendix J) and the Educator Behavior Contract (Appendix K). The purpose of the Educator Behavior Contract was to address threats to construct validity, specifically treatment diffusion, in which a participant receives information about a study condition (e.g., an intervention) to which they have not been assigned (Shadish, Cook, & Campbell, 2002). In this study, there was concern that a participating education provider who had received PRT training might share information about the
intervention with another participating education provider still in the baseline phase, particularly if they were colleagues in the same school. By signing the Educator Behavior Contract, education providers agreed not to share any information about the intervention with any other educators or students until the completion of the study. Education providers were asked to return signed consent forms within two weeks. If after two weeks, a signed consent form had not been returned, the principal investigator followed up by email and/or phone no more than twice. A total of seven education providers returned signed consent forms.

Once education providers indicated their interest in participating in the study, the principal investigator worked with the supervising teacher(s) to identify students who met the inclusion criteria for the study (see Participants section above) and who already worked with education providers who had signed the consent form. An introductory letter, parental consent form, student assent document, and video/audio release form were sent home to all students who met the inclusion criteria (see Appendices L, M, N, and O, respectively) and who already worked with education providers who had signed the consent form. Although participating students could have been over 18 years old, parental permission was required because of the potential for impaired decision-making capacity exhibited in this population (i.e., IQ range 50–100). Student assent was required both at the time of enrollment and before beginning the activities of the study. If signed consent forms were not returned within one week of distribution, a member of the research team and/or the teacher contacted the parent no more than twice by phone and/or by email. Signed materials were returned for a total of three students.

**Desensitization period.** Twice before beginning data collection, each education provider-student pair was video/audio recorded working together as they typically would. The purpose of this “desensitization” period was to provide time for the participants to acclimate to
the presence of a researcher and to being video recorded. These recordings were 15 minutes in length and were not coded for dependent variables. Pairs were informed of the purpose of these recordings, but did not receive any additional instructions beyond engaging in their typical one-on-one activities/interactions.

**Baseline Phase.** Baseline data were collected 1-2 times each week during regular activities in which the education provider and the student typically interacted one-on-one. This included time devoted to academics, life skills, or social skills instruction. In keeping with prior studies, no instructions or feedback was provided during this phase, other than prompting the education provider to interact with the student as they usually did (e.g., Feldman & Matos, 2013; Robinson, 2011). Fifteen-minute sessions were video/audio recorded and coded for student question-asking behaviors and education provider use of PRT components (i.e., fidelity of implementation). To align with the What Works Clearinghouse single-case design standards (Kratochwill et al., 2010), there was a minimum of five data collection points in the baseline phase for each participant.

**Education Provider Training in PRT.** Horner et al. (2005) state that, “Measurement of the dependent variable during a baseline should occur until the observed pattern of responding is sufficiently consistent to allow prediction of future responding.” As such, intervention did not begin until baseline data were stable for all participants. Stable data was defined as data without substantive trend (i.e., the general direction of a data path, including degree and variability; Cooper, Heron, & Heward, 2007; Horner et al., 2005).

Education providers were randomly assigned to the order in which they received training. Education Provider 3 was the first to receive training after six stable baseline data points. In order to maintain continuous data collection, an additional baseline session was scheduled for
immediately before the training session. At this session, the student presented an atypically high number of untargeted question initiations. This outlying data point was in the direction of desired change during intervention, but was not identified until after training had already commenced (i.e., the video was coded after the training, which immediately followed the final baseline session). Ideally, this issue would have been addressed with at least one additional baseline data collection to re-establish level and trend.

The principal investigator individually provided training in PRT to each education provider. The principal investigator was trained in PRT implementation at the Yale Child Study Center and had experience providing PRT to adolescents and young adults with ASD. Prior to beginning instruction in PRT, the principal investigator reviewed the Educator Behavior Contract, which the education provider had signed when they signed the consent form. The purpose of this review was to remind education providers that, for the duration of the study, they could not share the details of what they learned through the training with any other education provider or use PRT with any other students.

Elements of the training came from prior studies in which education providers already working in schools were trained to implement PRT in their school setting (Feldman & Matos, 2013; Robinson, 2011) and consisted of two phases: didactic training and providing video feedback (Appendix P).

**Didactic training phase.** During the didactic training phase, the principal investigator worked with each education provider individually as they were exited from the baseline phase. A PowerPoint Presentation, based on a presentation by Ventola (2010) was used to introduce education providers to the main concepts of PRT (Appendix Q). A revised version of the manual *How to Teach Pivotal Behaviors to Children with Autism: A Training Manual* (R. L. Koegel et
al., 1989) was reviewed with the education provider. The education provider was introduced to the definitions of each of the PRT components and was provided with a handout containing definitions, examples, and non-examples of each component (Appendix H). Education providers also watched and discussed video examples of PRT instruction. The education provider was taught how to set up motivating activities in which PRT could take place. In addition, the education provider was introduced to the three different types of targeted questions (i.e., what, where, and, who questions), along with a procedure to teach these questions to their assigned student (Doggett, Krasno, Koegel, & Koegel, 2013). Education providers reviewed a script for three different mini-lessons to teach the three types of questions to the target student (Appendix R), as well as an accompanying visual aid (Appendix S).

Education providers could elect to receive this training in one session or over the course of multiple sessions to accommodate their individual schedules. Education Provider 1 received training in one session, Education Provider 2 received training over the course of two sessions, and Education Provider 3 received training over the course of three sessions. In sum, the didactic training phase lasted approximately 2 hours per education provider.

**Video feedback phase.** After the didactic training phase, training was based on the procedures utilized by Feldman and Matos (2013) and Robinson (2011) and consisted of providing video feedback. During this phase, the education provider began using PRT with their assigned student. Each video feedback session began with the education provider reading the script for one of the three target questions mini-lessons (Appendix R). This first portion of the video/audio recorded session (i.e., the mini-lesson) was checked for fidelity of instruction. All education providers presented all mini-lessons with fidelity on the first attempt. After this, the education provider implemented PRT, providing opportunities for the student to utilize the target
question taught that day. The first 15 minutes of PRT were coded for both student dependent
variables and education provider fidelity. On average, sessions in the video feedback phase took
place over 26.5 minutes (range 19.5–35.5 minutes).

After each of the three sessions in the video feedback phase, performance feedback was
automatically provided to the education provider learning to implement PRT. Specifically, the
education provider and the principal investigator reviewed the PRT-implementation portion of
the video recording of the most recent session at a mutually convenient time prior to the
subsequent session. Video feedback sessions consisted of the following: (a) opening and
concluding positive statements (e.g., praise, encouragement), (b) specific praise for correct use of
PRT strategies, (c) performance-based corrective feedback for incorrect use of PRT strategies,
and (d) suggestions for improvement. Open-ended questions were asked to better understand the
education provider’s practice decisions.

**Intervention Phase.** Intervention took place 1-2 times per week. On average, these
sessions lasted for 24.5 minutes (range 10.5–39.5 minutes). During this time, the education
provider implemented PRT with a focus on providing opportunities for the target student to ask
the three types of target questions. Video/audio recordings were coded for dependent variables
and monitored for fidelity of implementation. If fidelity of implementation fell below 80%,
further performance feedback was provided, which consisted of meeting with the implementer to
watch and discuss the video/audio recording of the most recent PRT session, as well as to review
the PRT strategies and implementation.

At the completion of the intervention phase, education providers were asked to complete
a social validity form and return this by mail to the principal investigator. All three education
providers completed and returned this form.
Follow-up. A follow-up phase had been planned to collect maintenance data approximately 4 weeks after the completion of the intervention portion of the study. At this time, the education providers would have been asked to implement PRT with their student and data would have been collected on student question-asking behavior and education provider fidelity of implementation. Unfortunately, it was not possible to implement this phase because the intervention phase concluded with the end of the academic year.

In sum, the study took place over the course of 18 weeks. Pair 1’s participation took place over the full 18 weeks, Pair 2 participated for 16 weeks, and Pair 3 participated for 13 weeks.

Data Analysis

Visual analysis was used to analyze the data collected on student behaviors with the purpose of determining a functional relation (Cooper, Heron, & Heward, 2007; Kazdin, 2011). Kratochwill et al. (2010) write that “an experimental effect is demonstrated when the predicted changes in the dependent measures covary with manipulation of the independent variable.” As such, the visual analysis consisted of two parts: analysis within and analysis between conditions. Specifically, visual analysis within conditions involved examination of the variability, level, and trend of the data, as well as the total number of data points. Visual analysis between conditions involved comparisons of the data’s level, trend, and variability between different conditions and across participants (Cooper, Heron, & Heward). “Level” has to do with the average score of the data on the vertical access; “trend” deals with the general direction of data within a phase, as well as the degree of that slope; and “variability” refers to the fluctuation of the data (Cooper, Heron, & Heward; Kratochwill et al.).

Effect sizes were also calculated for targeted question initiations (i.e., the primary dependent variable) only. Specifically, Tau-U analysis was conducted using the Single Case
Research™ web-based calculator (Vannest, Parker, Gonen, & Adiguzel, 2016). Tau-U analysis takes into account non-overlap between phases as well as trend from within the intervention phase (Parker, Vannest, Davis, & Sauber, 2011). It is unique in single case design effect size measures because it controls for positive trend in the baseline data (Parker, Vannest, & Davis, 2011; Parker, Vannest, Davis & Sauber). For this study, Tau-U trend analysis was conducted for baseline and video feedback phases before conducting Tau-U contrast analysis. Any Tau-U trend result greater than 0.20 was controlled for in the subsequent contrast analysis (Vannest & Ninci, 2015). In this study, contrasts were run comparing data at all three phases (K. Vannest, personal communication with J. Freeman, April 6, 2018). Specifically, three types of Tau-U phase contrasts were calculated: 1) baseline vs. video feedback, during which baseline trend was controlled if deemed necessary based on the results of the trend analysis; 2) video feedback vs. intervention, during which video feedback trend was controlled if deemed necessary based on the results of the trend analysis; and 3) baseline vs. intervention, during which baseline trend was controlled if deemed necessary based on the results of the trend analysis.

Finally, social validity was summarized using descriptive statistics and further explicated with qualitative feedback from participants.
Chapter 4

Results

This chapter presents the results of the present study, with a focus on the visual analysis used to examine student dependent variables. It also includes visual analysis of the graphs for education provider fidelity of PRT implementation. It begins with a description of study participation, followed by the results as they pertain to the study research questions. It also presents results as related to (a) descriptive statistics, (b) effect sizes, (c) inter-observer agreement or reliability, and (d) social validity.

Study Participation

Three pairs consisting of an education provider and a secondary student with ASD participated in this research study examining the use of PRT in the high school setting to increase student question asking. The goal was to have two observation sessions per week per participant pair. However, there were several missing data points during baseline due to a range of circumstances, including: (a) weather-related school cancellations, (b) school spring break, (c) a member of the research team responsible for collecting data in the schools stopped attending his assigned recordings due to a personal crisis, (d) Education Provider 2 cancelled one session because Student 2 was having a difficult day, and (e) one of the recordings for Pair 3 was inaudible for Education Provider 3 and could not be coded. In addition, there were a few weeks when scheduling conflicts made it impossible to arrange for more than one data collection.

Baseline. On average, baseline took place over 13 sessions. Pair 1 participated in 20 sessions over 15 weeks, Pair 2 participated in 12 sessions over 11 weeks, and Pair 3 participated in seven sessions over 5 weeks.
**Intervention.** The What Works Clearinghouse Design Standards for Single Case Design studies maintain that in order for a multiple baseline design to meet the standards, there must be a minimum of 5 data points per phase (Kratochwill et al., 2010). However, the academic year ended before Pair 1 could participate in all five sessions. In sum, Pair 1 participated in four intervention sessions over two weeks, Pair 2 participated in seven intervention sessions over four weeks, and Pair 3 participated in five intervention sessions over four weeks. As such, the study meets the standards for number of data points per phase with reservations (Kratochwill et al.). Intervention for Pair 2 concluded at the beginning of Student 2’s final exam period, which created new demands on his time. Intervention for Pair 3 concluded because Education Provider 3 was no longer able to allocate time to the study with the additional demands of end-of-year activities. On average, sessions during the intervention phase lasted for 24.5 minutes (range 10.5–39.5 minutes).

**Research Question 1**

Research Question 1 asked “What is the effect of school-implemented PRT on target social communication goals in secondary students with ASD, specifically question-asking?” The purpose of this question was to examine the impact of PRT implementation on student question-asking behavior. Each observation session was coded for two student dependent variables: targeted question initiations and untargeted question initiations. Definitions of these dependent variables are provided in Chapter 3 and in Appendix E. Two rates were calculated based on the number of targeted and untargeted question initiations posed by the student per minutes of coded observation. These rates were subsequently graphed and analyzed using visual analysis. The visual analysis consisted of two parts: analysis within and analysis between conditions. Specifically, visual analysis within conditions involved examination of the variability, level, and
trend of the data, as well as the total number of data points. Visual analysis between conditions involved comparisons of the data’s level, trend, and variability between different conditions and across participants (Cooper, Heron, & Heward, 2007). The results for targeted question initiations are presented in Figure 4 alongside the data for Education Provider percentage of opportunities with PRT fidelity. This decision was made to allow for examination of the primary dependent variable in the context of the fidelity of the independent variable. Figure 5 presents the data for untargeted question initiations. In addition, descriptive statistics were calculated for each student dependent variable (Tables 1 and 3). The measure of effect size Tau-U (Parker, Vannest, Davis, & Sauber, 2011) was calculated for only the primary dependent variable (i.e., targeted question initiations), both for individual participants and for the aggregate (Table 2).

**Targeted question initiations.** Video coders (i.e., the principal investigator and the secondary coder) counted the total number of targeted question initiations asked by the student. The total number of targeted initiations was then divided by the total number of minutes coded to generate a rate of targeted question initiations. To be considered a targeted question initiation, the student had to ask a question that (a) began with one of the three target stems (i.e., who, what, or where), (b) made sense given the context of the interaction, and (c) was not modeled by the implementer (see Appendix E). Table 1 reports the number of sessions, median, and range for targeted question initiations in all study phases. Medians and ranges are reported (rather than means and standard deviations) because of the auto-correlated nature of single case design data. Overall, the median rate of targeted question initiations was low at baseline ($Mdn = 0.00$, Range 0.00 - 0.20). This overall median rate increased during the video feedback phase ($Mdn = 0.40$, Range 0.07 - 2.33) and continued to increase during the intervention phase ($Mdn = 0.70$, Range 0.00 - 2.27).
Table 2 reports the Tau-U trend and phase contrast analyses for targeted question initiations for individual participants, as well as the weighted aggregate. Tau-U phase contrasts were calculated comparing the following phases: baseline and video feedback, video feedback and intervention, and baseline and intervention (K. Vannest, personal communication with J. Freeman, April 6, 2018). For targeted question initiations, the weighted value for the Tau-U phase contrast between aggregated baseline and intervention phases was .80 and statistically significant (p < .0001). This means that the data showed 80% overall improvement between phases and during treatment (Parker, Vannest, Davis, & Sauber, 2011). Examination of the weighted Tau-U phase contrasts between aggregated baseline and video feedback phases (TAU-U = 0.89, p = 0.000) and aggregated video feedback and intervention phases (TAU-U = -0.03 p = 0.9075) suggests that this effect can be accounted for by first phase change. The following sections summarize the results for each student as related to targeted question initiations.

**Student 1.** Student 1 was a 19-year-old male attending a fulltime transition program run by the local education agency. He had a full-scale IQ of 58 on the *Wechsler Intelligence Scale for Children - Fourth Edition* (WISC-IV; Wechsler, 2003). For the study, he was a paired with a paraprofessional from the program with whom he already worked one-on-one.

Student 1’s baseline targeted question initiation rate was low and stable. At baseline, the median rate of targeted question initiations for Student 1 was 0.03 (Range .00-.20). Visual analysis of the baseline data suggested no trend, while Tau-U calculations indicated a slight negative trend (TAU-U = -0.10; see Table 2). Baseline trend was not adjusted for as it was negative and not greater than the suggested baseline trend of 0.10 to calculate the Tau-U effect size (Vannest & Ninci, 2015). During the video feedback phase, Student 1’s rate of targeted question initiations was variable (Range 0.07 - 0.60) and the median rate increased to 0.13,
though not immediately. This variability continued into the intervention phase, where Student 1’s median rate increased slightly ($Mdn = 0.20$). There was no clear trend in the data during the video feedback and intervention phases. Tau-U contrast between baseline and intervention phases for targeted question initiations for Student 1 was 0.45, which means that the data showed only 45% overall improvement between the first and third phases and during treatment. This was not statistically significant at the 0.05 level ($p = 0.163$). While there was overall improvement from baseline to intervention, Tau-U phase contrast analysis indicated a decline between video feedback and intervention phases (TAU-U = -0.5, $p = 0.289$) for Student 1’s rate of targeted question initiations.

**Student 2.** Student 2 was an 18-year-old male who worked with Education Provider 2 (his special education teacher) for the duration of the study. Student 2 attended a rural public high school. He had a full-scale IQ of 73 on the WAIS-IV. During baseline, Student 2 demonstrated the lowest level of targeted question initiations; he presented none across all sessions at baseline. Student 2’s median rate of targeted question initiations increased immediately at the beginning of the video feedback phase ($Mdn = 0.27$) and continued to increase into the intervention phase ($Mdn = 0.73$). While his data exhibited positive trend throughout the video feedback phase and the beginning of the intervention phase, it plateaued at the end of the intervention phase. Tau-U contrast between baseline and intervention phases for targeted question initiations for Student 2 was 1.0 (i.e., the data showed 100% overall improvement) and was statistically significant ($p < 0.001$).
Table 1

*Number of Sessions, Medians, and Ranges for Targeted Question Initiations*

<table>
<thead>
<tr>
<th></th>
<th>Number of sessions</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>20</td>
<td>0.03</td>
<td>.00-.20</td>
</tr>
<tr>
<td>Student 2</td>
<td>11</td>
<td>0.00</td>
<td>.00</td>
</tr>
<tr>
<td>Student 3</td>
<td>7</td>
<td>0.07</td>
<td>.00-.20</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>0.00</td>
<td>.00-.20</td>
</tr>
<tr>
<td><strong>Video Feedback Phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>3</td>
<td>0.13</td>
<td>.07-.60</td>
</tr>
<tr>
<td>Student 2</td>
<td>3</td>
<td>0.27</td>
<td>.20-.40</td>
</tr>
<tr>
<td>Student 3</td>
<td>3</td>
<td>2.15</td>
<td>.93-2.33</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>0.40</td>
<td>.07-2.33</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>4</td>
<td>0.20</td>
<td>.00-.40</td>
</tr>
<tr>
<td>Student 2</td>
<td>7</td>
<td>0.73</td>
<td>.33-.93</td>
</tr>
<tr>
<td>Student 3</td>
<td>5</td>
<td>1.20</td>
<td>.20-2.27</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>0.70</td>
<td>.00-2.27</td>
</tr>
</tbody>
</table>
Figure 4. Rate of student targeted question initiations and education provider percentage of opportunities with fidelity by session.
Table 2

*Table 2: Tau-U Trend and Phase Contrast Results for Student Targeted Question Initiations*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Trend</th>
<th>Video Feedback Trend</th>
<th>Baseline vs Video Feedback Trend</th>
<th>Video Feedback vs Intervention Contrast</th>
<th>Baseline vs Intervention Contrast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tau-U</td>
<td>Tau-U</td>
<td>Tau-U</td>
<td>p-value</td>
<td>Tau-U</td>
</tr>
<tr>
<td>Student 1</td>
<td>-0.10</td>
<td>1.00</td>
<td>0.70</td>
<td>0.055</td>
<td>-0.5*</td>
</tr>
<tr>
<td>Student 2</td>
<td>0.00</td>
<td>0.33</td>
<td>1.00</td>
<td>0.009</td>
<td>0.86*</td>
</tr>
<tr>
<td>Student 3</td>
<td>0.10</td>
<td>0.33</td>
<td>1.00</td>
<td>0.017</td>
<td>-0.53*</td>
</tr>
<tr>
<td>Weighted Aggregate</td>
<td>N/A</td>
<td>N/A</td>
<td>0.89</td>
<td>0.000</td>
<td>-0.03*</td>
</tr>
</tbody>
</table>

Note: “*” denotes Tau-U phase contrast analysis conducted with corrected video feedback trend due to high positive Tau results during initial trend analysis, as reported in column three.

**Student 3.** At the start of data collection, Student 3 was 14-years-old. He worked with Education Provider 3 (a paraprofessional in his classroom) for the duration of the study. He received his education in the same rural public school as Student 2. His full-scale score on the **WISC-IV** was 58.

Visual analysis of the baseline data suggested a slight positive trend in targeted question initiation rate, which was confirmed by Tau-U calculations (Tau-U = 0.10). Baseline trend was not adjusted because “a general rule of thumb is that when a trend is under 0.10 or even 0.20, it does not need correcting” (Vannest & Ninci, 2015, p. 407). During baseline, Student 3’s median
rate of targeted question initiations was low and exhibited little variability (\(Mdn = 0.07\), Range 0.00 - 0.20). This pattern changed during the video feedback and intervention phases. The level of Student 3’s rate of target question initiations increased immediately once Education Provider 3 began using PRT strategies during the video feedback session. While Student 3’s median rate during the intervention phase (\(Mdn = 1.20\)) remained higher than it had at baseline, these data were highly variable (Range 0.20 - 2.27) and had a slight negative trend, which was confirmed by Tau-U trend contrast analysis between video feedback and intervention phases (TAU = -0.53). Nonetheless, Tau-U contrast between baseline and intervention phases for targeted question initiations for Student 3 was 0.94 and was statistically significant (p < 0.01).

**Untargeted question initiations.** Video coders recorded the total number of novel, untargeted questions posed by the student to evaluate general improvements in the skill of question-asking (R. K. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). This frequency count was then divided by the duration of the observation to calculate a rate of untargeted question initiations per minute. Untargeted Question Initiations included question types not taught as part of the intervention (i.e., questions not beginning with who, what, and where) and that made sense given the context of the interaction. Visual analysis for untargeted question initiations was based on the graph presented in Figure 5. Table 3 reports the number of sessions, medians, and ranges for untargeted question initiations by participant and in the aggregate in all study phases. Across participants, the median rate of untargeted question initiations was zero at baseline (Range 0.00 – 1.00). The overall median rate increased during the video feedback phase (\(Mdn = 0.13\), Range 0.00 – 1.13) and continued to increase during the intervention phase (\(Mdn = 0.53\), Range 0.00 – 1.82). The following sections summarize the results for each student as related to untargeted question initiations.
Table 3

*Number of Sessions, Medians, and Ranges for Untargeted Question Initiations*

<table>
<thead>
<tr>
<th></th>
<th>Number of sessions</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>20</td>
<td>0.07</td>
<td>0.00 - 0.40</td>
</tr>
<tr>
<td>Student 2</td>
<td>11</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Student 3</td>
<td>7</td>
<td>0.27</td>
<td>0.00 - 1.00</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>0.00</td>
<td>0.00 – 1.00</td>
</tr>
<tr>
<td><strong>Video Feedback Phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>3</td>
<td>0.07</td>
<td>0.00 - 0.13</td>
</tr>
<tr>
<td>Student 2</td>
<td>3</td>
<td>0.07</td>
<td>0.00 - 1.13</td>
</tr>
<tr>
<td>Student 3</td>
<td>3</td>
<td>0.62</td>
<td>0.60 - 1.07</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>0.13</td>
<td>0.00 – 1.13</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 1</td>
<td>4</td>
<td>0.17</td>
<td>0.07 - 0.47</td>
</tr>
<tr>
<td>Student 2</td>
<td>7</td>
<td>0.53</td>
<td>0.00 - 1.73</td>
</tr>
<tr>
<td>Student 3</td>
<td>5</td>
<td>1.20</td>
<td>1.07 - 1.82</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>0.53</td>
<td>0.00 - 1.82</td>
</tr>
</tbody>
</table>
Figure 5. Rate of student untargeted question initiations by session.
**Student 1.** Student 1’s rate of untargeted question initiations exhibited a low degree of variability during baseline and remained relatively stable throughout the video feedback and intervention phases (see Figure 5). While the median rate remained the same from baseline to video feedback phase ($Mdn = 0.07$ in both phases), it increased slightly during the intervention phase ($Mdn = 0.17$). Visual analysis suggested no clear trend in the data at any phase.

**Student 2.** During baseline, Student 2 demonstrated the lowest rates of untargeted question initiations, with a steady state at zero. The level of Student 2’s rate of untargeted question initiations increased during the video feedback phase, though not immediately. Student 2’s median rate of untargeted question initiations increased from the video feedback to the intervention phase ($Mdn = 0.07, 0.53$, respectively). However the data in both of these phases were very variable.

**Student 3.** Initially, Student 3 exhibited consistently low rates of untargeted question initiations during baseline. However, as noted in Chapter 3, Education Provider 3 was the first to receive training after six stable baseline data points. In order to maintain continuous data collection, an additional baseline session was scheduled for immediately before the training session. At this session, the student presented an atypically high number of untargeted question initiations. This outlying data point was in the direction of desired change during intervention, but was not identified until after training had already commenced (i.e., the video was coded after the training, which immediately followed the final baseline session).

Visual analysis suggests that Student 3’s level of rate of untargeted question initiations increased from phase to phase. Student 3’s median rate of untargeted question initiations increased at each phase, from 0.27 (Range 0 – 1.00) at baseline, to 0.62 (Range 0.60 - 1.07) during the video feedback phase, to 1.20 (Range 1.07 - 1.82) during intervention. As mentioned
above, there is a positive trend in the data at baseline. There is a negative trend in data during video feedback and no clear trend during intervention.

**Research Question 2**

Research question 2 asked “Can education providers at the secondary level be trained to implement PRT with fidelity?” with the purpose of examining the education providers’ ability to implement the independent variable (i.e., PRT) with fidelity before, during, and after training. Percentage of opportunities with fidelity was calculated as the number of opportunities implemented with fidelity divided by the total number of opportunities in the session. For an opportunity to be considered implemented with fidelity, the education provider had to correctly implement all seven of the PRT strategies within that opportunity. The percentages of opportunities with fidelity were subsequently graphed and analyzed using visual analysis. These results are presented in Figure 4, alongside the corresponding rate of targeted question initiations per session. Descriptive statistics are provided in Table 4. These tables present results by individual education provider, as well as overall combined results. Overall, the median percentage of opportunities with fidelity increased from baseline (\(Mdn = 7.83\%, \ Range \ 0.00\% - 33.33\%\)) to intervention (\(Mdn = 59.16\%, \ Range \ 24.71\% - 89.36\%\)). However, the median score never reached the 80% criterion for PRT fidelity. Visual analysis and descriptive statistics are further described below.
Table 4

*Number of Sessions, Medians, Minimum, and Maximum Values for Percentage of Opportunities with Education Provider PRT Fidelity of Implementation*

<table>
<thead>
<tr>
<th></th>
<th>Number of Sessions</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Provider 1</td>
<td>20</td>
<td>18.05</td>
<td>0.00</td>
<td>33.33</td>
</tr>
<tr>
<td>Education Provider 2</td>
<td>12</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Education Provider 3</td>
<td>6</td>
<td>6.89</td>
<td>0.00</td>
<td>27.59</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>7.83</td>
<td>0.00</td>
<td>33.33</td>
</tr>
<tr>
<td><strong>Video Feedback</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Provider 1</td>
<td>3</td>
<td>38.10</td>
<td>29.31</td>
<td>50.00</td>
</tr>
<tr>
<td>Education Provider 2</td>
<td>3</td>
<td>27.42</td>
<td>20.00</td>
<td>73.21</td>
</tr>
<tr>
<td>Education Provider 3</td>
<td>3</td>
<td>45.57</td>
<td>33.33</td>
<td>51.43</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>38.10</td>
<td>20.00</td>
<td>73.21</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Provider 1</td>
<td>4</td>
<td>52.33</td>
<td>40.96</td>
<td>60.42</td>
</tr>
<tr>
<td>Education Provider 2</td>
<td>7</td>
<td>81.82</td>
<td>64.00</td>
<td>89.36</td>
</tr>
<tr>
<td>Education Provider 3</td>
<td>5</td>
<td>28.57</td>
<td>24.71</td>
<td>57.89</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>59.16</td>
<td>24.71</td>
<td>89.36</td>
</tr>
</tbody>
</table>
**Education Provider 1.** Education Provider 1 exhibited low levels of fidelity of PRT implementation at baseline ($Mdn = 18.05\%$, Range $0.00\% – 33.33\%$). Visual analysis suggested no clear trend. The level of fidelity increased during the video feedback phase ($Mdn = 38.10\%$, Range $29.31\% – 50.00\%$), and continued to increase in the intervention phase ($Mdn = 52.33\%$, Range $40.96\% – 60.42\%$). Visual analysis suggested a positive trend in both the video feedback and intervention phases. However, Education Provider 1 never achieved the criterion for fidelity of implementation (i.e., $80\%$) necessary to be considered implementing PRT with overall fidelity. As such, Education Provider 1 received performance feedback before each session in the intervention phase; specifically, Education Provider 1 received performance feedback four times during the intervention phase.

**Education Provider 2.** At baseline, Education Provider 2 presented no opportunities that met the criteria for fidelity of PRT implementation. Her percentages of opportunities with fidelity increased immediately upon receiving training, as evidenced by the change in level and the positive trend in the video feedback phase ($Mdn = 27.42\%$, Range $20.00\% – 73.21\%$). This level also increased in the intervention phase. While data in the video feedback phase were variable, there much less variability during intervention. In the intervention phase, Education Provider 2 was able to implement PRT with fidelity (i.e., $80\%$ of opportunities in the coded portion of the session utilized all seven PRT strategies); specifically, she reached the target criterion four out of seven times ($57.14\%$).

**Education Provider 3.** While Education Provider 3 participated in seven baseline sessions, upon review, one of the video/audio recordings was inaudible for the Education Provider only (i.e., Student 3 was audible). As such, this video was not coded for Education
Provider variables and only six baseline sessions were considered in the visual and statistical analyses.

Education Provider 3 exhibited low levels of fidelity of PRT implementation at baseline, though this was accompanied by some variability ($Mdn = 6.89\%$, Range $0.00\% – 27.59\%$). Visual analysis suggested no clear trend. Education Provider 3’s level of fidelity increased immediately after didactic training as evidenced by examination of the video feedback phase ($Mdn = 45.57\%$, Range $33.33\% - 51.43\%$); during this phase, there was an increase in level and a positive trend. This level stayed the same during the intervention phase, but was accompanied by increased variability ($Mdn = 28.57\%$, Range $24.71\% - 57.89\%$). The intervention phase concluded with a slight positive trend. Education Provider 3 never achieved the criterion for fidelity of implementation (i.e., $80\%$) necessary to be considered implementing PRT with overall fidelity. As such, Education Provider 3 received performance feedback before each session in the intervention phase; specifically, Education Provider 3 received performance feedback five times during the intervention phase.

**Inter-Observer Agreement**

As stated in Chapter 3, throughout the study, inter-observer agreement (IOA) was calculated for $31.74\%$ of observations; IOA calculations were conducted for $31.58\%$ of baseline sessions, $33.3\%$ of video feedback sessions, and $31.75\%$ of intervention sessions. To prevent observer drift, approximately every third video/audio recording was coded by the secondary coder and IOA was calculated.

**Student dependent variables.** For targeted and untargeted question initiations, IOA was calculated using the mean count-per-interval method (Cooper, Heron, & Heward, 2007). IOA for targeted question initiations was high throughout the study with a mean of $99.4\%$ in baseline
(Range 93.3% - 100.0%), 97.2% in the video feedback phase (Range 93.3% - 100.0%), and 100.0% in intervention. Across phases, mean IOA for targeted question initiations was 99.3% (Range 93.3% - 100.0%).

IOA for untargeted question initiations was also high throughout the study. Across phases, the average IOA for untargeted question initiations was 99.17% (Range 86.7% - 100.0%). At baseline, the mean IOA for untargeted question initiations was 98.9% (Range 86.7% - 100.0%). During the video feedback phase, average IOA was 100.0%. Average IOA for untargeted question initiations was 99.3% (Range 96.7% - 100.0%) during the intervention phase.

**Education provider fidelity.** For percentage of opportunities with fidelity, IOA was computed using trial-by-trial IOA, which was described in Chapter 3. IOA for the education provider behavior was high throughout the study. Total IOA was 90.16% (Range 77.4% - 100.0%). IOA was also high when considered by phase: at baseline, mean IOA was 87.8% (77.4% - 100.0%); during video feedback, mean IOA was 91.5% (Range 88.9% - 96.2%); and during intervention, mean IOA was 93.6% (Range 88.87% - 100.0%).

**Social Validity**

At the completion of the study, Education Providers were asked to complete anonymously the “Implementer Satisfaction Questionnaire” (Appendix G). This questionnaire was based on social validity forms used by Feldman and Matos (2013) and Robinson (2011). It consisted of eight Likert-style questions and five open-ended qualitative questions. Ratings were provided on a 5-point Likert-style scale ranging from “1” (strongly disagree) to “5” (strongly agree). Table 5 presents the results from the Likert-style questions.
Table 5

*Implementer Satisfaction Questionnaire Means and Standard Deviations*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel satisfied with the training I received as part of this study.</td>
<td>4.67</td>
<td>0.58</td>
</tr>
<tr>
<td>The strategies I learned benefited my assigned student.</td>
<td>4.6</td>
<td>0.58</td>
</tr>
<tr>
<td>I enjoyed using these strategies with my student.</td>
<td>4.67</td>
<td>0.58</td>
</tr>
<tr>
<td>I will continue to use these strategies with my student.</td>
<td>4.67</td>
<td>0.58</td>
</tr>
<tr>
<td>I will use these strategies in the future with other students.</td>
<td>5.0</td>
<td>0</td>
</tr>
<tr>
<td>I felt comfortable being video recorded as part of the study.</td>
<td>4.0</td>
<td>0</td>
</tr>
<tr>
<td>I felt comfortable receiving feedback on my use of the strategies.</td>
<td>5.0</td>
<td>0</td>
</tr>
<tr>
<td>I would recommend this training to others.</td>
<td>5.0</td>
<td>0</td>
</tr>
</tbody>
</table>

The five open-ended questions on the “*Implementer Satisfaction Questionnaire*” were designed to elicit qualitative feedback from education providers about the training they had received. All three education providers reported that the modeling was the most useful part of their training. They reported that no aspects of the training were unhelpful. When asked for suggestions to improve training in the future, one education provider responded that they would like more modeling, specifically “how to properly use PRT with specific toys and difficult student behaviors.” The other two education providers said they did not have any suggestions for improvement. Education providers were asked to report on their concerns regarding the techniques they had learned. Two education providers shared concerns; one wanted more time to master PRT, and the other expressed concern about how PRT would work in situations with multiple students. Finally, education providers were invited to share any other thoughts. One
education provider took this opportunity to share the following: “I am thrilled that I had an opportunity to be introduced to PRT. I also feel the training I received was conducive to an engaging, comfortable, and informative experience. I was in a position where I felt very comfortable to ask questions and make mistakes.”

This chapter outlined the results from the concurrent multiple baseline design study across dyads. It discussed the results as related to the two study research questions, presenting the results of the visual analysis, descriptive statistics, and the Tau-U analysis. In addition, the chapter included a summary of the reliability analysis. Finally, the chapter addressed the social validity of the study by describing the quantitative and qualitative feedback from the education providers. The final chapter includes a discussion of these results, study limitations, implications, and directions for future research.
Chapter 5

Discussion

Difficulty with social interaction is known to negatively impact adult outcomes (i.e., quality of life, independent living, participation in postsecondary education, employment) for adolescents and young adults with ASD (e.g., Newman et al., 2011). As such, there is an immediate need to develop and test ways to teach social skills to high school students with ASD. Question asking plays a critical role in social interactions and is a skill with which many people with ASD struggle (Laugeson & Ellingsen, 2014; Paul et al., 2004).

PRT is an evidence-based behavioral treatment; many studies have supported its effectiveness in improving the social and communication skills of children with ASD, including question asking (e.g., R. L. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). However, it is primarily implemented with young children and in the clinical setting. There is an urgent need to make evidence-based practices available to adolescents/young adults with ASD through school programs (Stahmer, Collings, & Palinkas, 2005). This study contributes to the literature by bringing PRT into the secondary school setting. It also sought to help address the need for interventions to teach social and communication skills to adolescents with ASD.

This study used a concurrent multiple baseline design study across dyads to investigate whether PRT could be used to teach question asking to adolescents with ASD in the secondary school setting. Education providers (i.e., one special education teacher and two paraprofessionals) in secondary schools were trained to implement PRT one-on-one with a student with ASD. All sessions were video/audio recorded and coded for student question-asking behavior (i.e., targeted and untargeted question initiations) and percent of opportunities with education provider fidelity of PRT implementation. At the completion of the study, education
providers provided quantitative and qualitative feedback through an anonymous social validity survey.

This final chapter discusses the results as related to the two study research questions: 1) what is the effect of school-implemented PRT on target social communication goals in secondary students with ASD, specifically question asking?, and 2) can education providers at the secondary level be trained to implement PRT with fidelity? Because student and education provider behaviors are linked in this study, this chapter will also examine student target question initiations in light of education provider fidelity of PRT implementation. It concludes with a discussion of the results of the social validity survey, study limitations, implications for practitioners and researchers, and directions for future research.

**Research Question 1**

Research question 1 asked “What is the effect of school-implemented PRT on target social communication goals in secondary students with ASD, specifically question asking?” The purpose of this question was to examine the impact of PRT implementation on student question-asking behavior. Student question-asking behavior was examined through two dependent variables: targeted and untargeted question initiations.

**Targeted question initiations.** The primary dependent variable for this study was student targeted question initiations. Visual analysis of the data indicated that there were clear effects for two student participants (i.e., Students 2 and 3). However, experimental control must be demonstrated through three demonstrations of effects at three different points in time (Horner et al., 2005). As such, there was no functional relation between the independent variable (i.e., PRT implementation) and student targeted question initiations. While there was no functional relation, the results suggested the potential for PRT to improve the rate of targeted question
initiations in secondary students with ASD. This is confirmed by the Tau-U analysis. For two of the three students, the effect size was high (TAU-U = 1.00, 0.94) and statistically significant (p < 0.01). Overall, the weighted Tau-U phase contrast analysis between aggregated baseline and intervention phases was high and statistically significant (TAU-U = 0.80, p < 0.001). This large effect size indicates the potential for PRT to result in statistically significant and practically meaningful increases in students’ use of targeted question initiations. More sessions in the intervention phase, particularly for Student 1, may have allowed for the demonstration of a functional relation. Unfortunately, the academic year ended before more data could be collected. Targeted question initiations in the context of the fidelity of implementation data are further discussed below.

**Untargeted question initiations.** The rate of untargeted question initiations per minute was measured to examine the effects of the intervention on an untargeted by related skill. This secondary dependent variable was examined in order to determine if students’ use of question asking would increase in general as the student received direct instruction in three specific types of questions (i.e., questions beginning with *who, what, and where*). Visual analysis of the data and examination of the descriptive statistics suggested that for two students, there was improvement in this area that was not directly targeted by the independent variable (Tau-U analysis was not conducted for untargeted question initiations because it was a secondary dependent variable). Untargeted question initiations followed a similar pattern to that of targeted question initiations. Students 2 and 3 demonstrated effects, with an increase in level of untargeted question initiations per minute after introduction of the independent variable. However, Student 2’s data was more variable for untargeted question initiations in the intervention phase than it had been for targeted question initiations. Student 1 did not respond to
intervention and his data remained almost identical across all three phases. While not definitive, the changes exhibited in the behaviors of two of the students suggest the potential for PRT to increase question-asking behavior more generally in secondary students with ASD, even when specific question stems are targeted.

**Research Question 2**

Research question 2 asked “Can education providers at the secondary level be trained to implement PRT with fidelity?” Through visual analysis of the data related to education provider fidelity of PRT, it can be concluded that all three education providers improved in their ability to implement PRT as a result of the training they received. There was a clear pattern between the staggered introduction of training and improvement in fidelity of PRT implementation. This conclusion was supported by comparison of the descriptive statistics between phases and across participants; for each participant, there was increase in median fidelity between baseline and intervention phases. Visual analysis and examination of the descriptive statistics suggested that most of the change took place after the didactic training, rather than after the video feedback phase of training. However, video feedback did contribute to improvements in fidelity. For the most part, fidelity continued to increase after the video feedback phase; all three of the education providers achieved their high score after the video feedback phase. This suggests that both components of the training contributed to the observed effects.

Although there were clear effects between training and fidelity for all three education providers, only one of the participants was able to achieve overall fidelity with PRT, which was defined as demonstrating each PRT component in 80% of opportunities (R. L. Koegel & Koegel, 2006; Ventola et al., 2014). Education Provider 2 implemented PRT with a high 89.36% fidelity
during the intervention phase. Although Education Providers 1 and 3 improved in fidelity over the course of the study, their high scores were 60.42% and 57.89%, respectively.

In considering the varying levels of achievement in implementing PRT with fidelity, it is worth examining some of the differences among the participating education providers. Education Provider 2 was the only special education teacher participating in the study (the other two education providers were paraprofessionals). She was also the only participant with any prior experience with ABA. This level of prior training and experience may have contributed to her ability to master the PRT strategies in a shorter time than the other participants. It is also possible that something about the teacher-student relationship was different than the paraprofessional-student relationship, which impacted the results; however, given the small sample size, further conclusions were outside of the scope of this study. This would be an interesting area for future research.

Visual analysis indicated that all three participants’ data had positive trend in the intervention phase; this was least apparent for Education Provider 3, though trend analysis resulted in a line of best fit with a small positive slope ($B = 0.46$). The positive trends suggested that all three participants may have continued to improve in their fidelity given more time to practice PRT and more opportunities to receive performance feedback. Education Provider 2, who was the only education provider to reach the criterion for fidelity, had the greatest number of sessions in the intervention phase ($n = 7$). Education Provider 1 had only four sessions during the intervention phase because the study ended with the end of the academic year; Education Provider 3 had five sessions in the intervention phase and then concluded her portion of the study due to increased professional responsibilities. Perhaps if either of these education providers had had the opportunity to participate in more intervention sessions, they too would have achieved
fidelity. Importantly, the results of the social validity analysis completed at the conclusion of the study and which are further discussed below, suggest that participants would have a positive response to continued training. Indeed, in the qualitative feedback provided as part of the “Implementer Satisfaction Questionnaire,” one participant explicitly said that they would have liked more time to practice the skills learned through the study.

Some qualitative notes provide further information about areas in which education providers struggled when implementing PRT, and which negatively impacted their fidelity scores. In PRT, almost every statement made by the implementer is considered a prompt. If this prompt is not followed through (i.e., the implementer does not elicit and reinforce a student response), then this opportunity is considered implemented without fidelity. As education providers were learning PRT, they often made comments that they did not “follow through,” and this impacted their overall fidelity. Another area of struggle was providing clear directions for activities. In particular, Education Providers 1 and 3 struggled to explain the PRT activities in an understandable way to the students, which complicated the rest of the session. In future studies, more instruction should be given in how to provide directions for PRT activities; providing scripts that education providers could use to introduce the rules for games or activities might help to mitigate this problem.

**Targeted Question Initiations in the Context of Education Provider Fidelity of PRT Implementation**

While there was no functional relation between the primary student dependent variable and the independent variable (i.e., education provider fidelity of PRT implementation), it is worth examining the relationship between these two variables in closer detail. Because education providers rarely achieved PRT implementation with fidelity and therefore there was variability in
the independent variable, student behavior must be interpreted in light of education provider behavior.

**Pair 1.** As Education Provider 1’s percentage of opportunities with fidelity slowly and steadily increased through the video feedback and intervention phases, Student 1 began to show increased variability in the rate of targeted question initiations. While he still had several sessions with near zero rates (almost all sessions in baseline were close to zero), he also had sessions with his highest rates thus far. This change in student behavior suggests that the gradual change in fidelity was enough to subtly impact rate of student targeted question initiations, but not in a substantial way. Perhaps if Education Provider 1 had had the opportunity to practice his use of PRT further through a longer intervention phase, his data would have continued along the positive trend exhibited in Figure 4. It is possible that, once Education Provider 1 approached the 80% criterion for fidelity, there would have been more responsiveness in Student 1’s data. Unfortunately, the study concluded with the end of the academic year and before more data could be collected. Future research should examine change in education provider fidelity and student behavior during an extended intervention phase.

Another important consideration is that activities at baseline were selected by Student 1. These activities were highly desirable to him and were under his control. In contrast, during intervention Student 1 often appeared frustrated with the interaction and with having to work within the PRT structure, particularly when Education Provider 1 struggled with implementing strategies with fidelity. It is possible that Student 1 may have found the interactions more motivating (possibly yielding more targeted question initiations) once Education Provider 1 had mastered PRT and was able to implement more fluently.
**Pair 2.** Throughout the study, the variability of Education Provider 2’s fidelity of implementation was lowest. At baseline, her fidelity was a constant at zero. Once Education Provider 2 achieved the criterion for fidelity in the intervention phase, her level of fidelity hovered around 80%. Education Provider 2’s reliable levels of fidelity of implementation were accompanied by equally constant rates of targeted question initiations by Student 2. During, baseline Student 2 also exhibited a steady state of zero for the dependent variable. During intervention, as Education Provider 2’s fidelity hovered around the criterion for fidelity, the level of Student 2’s rate of targeted question stayed relatively constant around 0.75. During the video feedback phase, as Education Provider 2 began to implement PRT strategies, Student 2’s rate of targeted question initiations slowly began to increase. This change occurred even though Education Provider 2 was not implementing PRT at fidelity. Overall for Pair 2, dramatic changes in education provider behavior corresponded to similar changes in student behavior.

**Pair 3.** Visual examination of Figure 4 indicates that throughout the study, Student 3’s rate of targeted question initiations closely coincided with Education Provider 3’s percentage of opportunities with fidelity. At baseline, Student 3 posed almost no targeted question initiations and Education Provider 3’s percentage of opportunities with fidelity was quite low. However, as soon as Education Provider 3 began utilizing PRT strategies during the video feedback phase, Student 3’s rate of targeted question initiations increased. Indeed, during the video feedback and intervention phases, Student 3’s data path mirrors that of Education Provider 3, but with more variability; as Education Provider 3 provided more opportunities with fidelity, Student 3 posed more questions, and when education provider had a dip in fidelity, Student 3 had a dip in question asking behavior. Indeed, variable fidelity appears to have contributed to some of the variability in student behavior. Taken together, examination of Pair 3’s data suggests student
responsiveness to an independent variable that was delivered with only partial fidelity. Put another way, even though Education Provider 3 was not fully implementing PRT, the intervention still had a positive impact on an important student target behavior. This indicates the potential for this intervention to further improve rates of targeted question initiations if delivered with fidelity.

**Summary of student behavior in the context of education provider fidelity.** Taken together, these individual examinations of the relationship between PRT fidelity and targeted question initiations suggest that, as education provider behavior changed, so did student behavior. Interestingly, the patterns of these behavior changes differed across pairs. For Pair 3, student variability matched variability in fidelity. For Pair 1, student behavior did not mirror that of education provider fidelity. However, as Education Provider 1 slowly started to implement PRT, there was an indication of possible change in Student 1’s behavior. Pair 2 showed promise for the effects of implementing PRT with fidelity. When Education Provider 2 implemented PRT with fidelity, Student 2 exhibited a correspondingly stable higher level of target question initiations per minute. Although there was no functional relation between the independent and dependent variables, the individual patterns described above show potential promise for the use of PRT in the secondary setting with students with ASD. Each of these relationships demonstrates some (albeit sometimes very small) impact on an important student behavior when education provider percentage of opportunities with fidelity increased. These relationships clearly demonstrate the need and potential for more research into the area of school-based PRT implementation for secondary students with ASD.
Social Validity

The results of the social validity survey were overwhelmingly positive. All participants indicated that they felt the strategies they learned were useful and enjoyable. Importantly, all participating education providers stated that they would continue to use the strategies with their current student and that they would use the strategies that they learned with future students. One of the goals of this study was to increase the use of evidence-based practices with students with ASD in the secondary school setting. Education providers’ continued use of the PRT strategies after the completion of the study supports achievement of this goal.

Limitations

The limitations of this study should be considered when interpreting the results, findings, and implications. Study limitations had to do with lack of fidelity for the independent variable, risk of coder bias, challenges with IOA, heterogeneity of settings and education providers, and challenges of conducting research in the classroom setting. These limitations are discussed in detail below.

Lack of fidelity for the independent variable. As stated above, only one of the education providers was able to implement PRT at the 80% criterion necessary for fidelity. At times during the intervention phase, even this education provider fell below the level for fidelity. As such, in almost all of the sessions, the independent variable was not implemented with fidelity. Clearly this impacts the ability to draw conclusions about the impact of the independent variable. Specifically, unreliability of treatment implementation constitutes a threat to statistical conclusion validity. As Shadish, Cook, and Campbell note, if a standardized treatment is only partially implemented for some participants, “effects may be underestimated compared with full implementation” (2002, p. 45).
**Risk of coder bias.** The study’s principal investigator was also the study’s primary data collector, implementer, and video/audio coder. When the researcher performs so many study functions, there is an increased risk of bias (Kazdin, 2011). That being said, IOA was calculated and found to be high for both student dependent variables and education provider fidelity across all three phases of the study. Didactic training fidelity data was not collected because of constraints in time and resources.

**Challenges with IOA.** In the original proposal, IOA was intended to be coded for every third video in the order in which videos were recorded and as they were being recorded. The intention of this procedure was to protect against observer drift (Cooper, Heron, & Heward, 2007) and confirm the primary coder’s (i.e., the principal investigator’s) coding, which determined whether or not education providers met the criterion for performance feedback during the intervention phase. However, calculation of IOA proved more challenging than originally predicted. These challenges centered on reaching the 80% criterion for IOA when coding videos recorded during the baseline session. It was hypothesized that these challenges stemmed from mapping interactions that were clearly not PRT onto the PRT fidelity coding sheet, in particular determining what constituted an opportunity. This issue was addressed by more clearly defining “opportunity” (see Appendix K). However, it took some time to identify and rectify the problem. The principal investigator and secondary coder had to re-code several videos multiple times. As such, the secondary coder’s final code of video/audio recordings did not take place as videos were being recorded as was originally intended, but rather after all data collection was complete. At this time, videos were still coded in the order in which they were filmed as had been originally proposed. However, as ultimately all videos were coded for IOA at the completion of the study, a stronger study design would have been for the secondary coder to
code videos in a random order and blind to the study phase. This would have helped to address reliability concerns centering on the principal investigator’s prior knowledge and biases (Kazdin, 2011). In addition, the principal investigator and secondary coder coded all videos together simultaneously from the same computer; this may have interfered with observer independence, which is an important element for valid IOA (Cooper, Heron, & Heward).

**Heterogeneity of settings and education providers.** Diversity in participant settings and education providers may be seen as a limitation to this study. This variety makes interpreting variations in results more challenging and may present a threat to statistical conclusion validity (i.e., the validity of inferences about whether the independent and dependent variable covary; Shadish, Cook, & Campbell, 2002). In this study, two student participants received their educations in a traditional high school setting and one student participant received his education in a full-time transition program that was separate from the school. It was initially hoped that the narrow inclusion criteria for the students themselves would mitigate concerns about diversity of setting. However, the student inclusion criteria was expanded to aid with recruitment challenges; specifically, not enough students met the inclusion criteria of IQ 60-80, so it was expanded to IQ 50-100. As such, a range of students and settings were included in the study, which may complicate making inferences based on the results.

The decision to use a range of implementers was deliberately made to accommodate the structures and needs of real school settings. This reflects a primary goal of the study: to bring PRT into school settings in a way that will be both useful to teachers and students, and realistic for the unique structure of secondary school environments. However, the heterogeneity of education providers may also be seen as a limitation to this study and impact interpretation of its results. As mentioned above, different education providers responded differently to the same
training. The diversity of their professional roles and educational backgrounds presents a selection challenge (i.e., threat to internal validity; Shadish, Cook, & Campbell, 2002) and makes it challenging to draw conclusions about why they responded differently to the training.

**Challenges associated with doing research in a real school setting.** There were several challenges that centered on working in a real school setting that should be taken into account when interpreting results. As Odom et al. (2005) write, “special education research, because of its complexity, may be the hardest of the hardest-to-do sciences” (p. 139). Indeed, extraneous variance in the experimental setting is a reality in field settings such as schools. As such, this threat to statistical conclusion validity must be taken into account when interpreting results (Shadish, Cook, & Campbell, 2002).

**Classroom setting.** For all pairs, the fact that the study took place in the school setting may have impacted results. Each pair had at least one session that was interrupted by another teacher or student. Pair 2 always met in their regular classroom with other students and educators nearby and Pair 1 often met in school common areas, which could be entered and used by other students. These distractions may have impacted both student and education provider behavior. Importantly, implementation in the classroom setting should also be considered a strength of this study. Several decades of research consistently demonstrated that people with ASD are more likely to acquire skills when intervention takes place in natural environments such as schools and that this increases the likelihood of generalization and maintenance (e.g., Forgan & Jones, 2002; Gena, Krantz, McClannahan, & Poulston, 1996). Unfortunately, this study did not attempt to measure generalization of learning in different environments and ran out of time to test for maintenance. This would be an excellent direction for future research.
**Missed observations and dosage.** There were several missed data collections throughout all phases of the study, which often had to do with the scheduling challenge of working with a real school. Sessions were missed because of school break, absences, students having challenging days, and snow days. Pair 1 missed its final intervention session because of the conclusion of the academic year. Pairs 2 and 3 missed sessions because of the challenge of scheduling observations around their school’s complex rotating schedule. Missed observations may interfere with continuous assessment, which is one of the general requirements for single-case designs (Kazdin, 2011).

**Scheduling didactic training sessions.** As stated above, a goal of this study was to bring PRT into the secondary school setting in a way that would minimize disruption for education providers and students. As such, didactic training was set up in a way to accommodate education providers’ unique schedules. While the content was the same for all education providers, didactic training could be presented in one training session or divided across multiple sessions. This increased variability in the training received by the education providers and should therefore be considered a limitation of the study.

**Implications**

Despite the lack of functional relation and the limitations outlined above, the results of the study still hold some potential, particularly if bolstered by future research. Although education providers in general struggled to achieve the 80% criterion for fidelity, they all increased in their ability to implement PRT. In two cases, this increase in use of PRT strategies corresponded with a clear and dramatic increase in student question-asking behaviors. As such, there are relevant implications for both practitioners and researchers.
Implications for Practice. Schools are federally mandated to use evidence-based practices to the greatest extent possible (Individuals with Disabilities Education Improvement Act, 2004). Unfortunately, options are limited for educators seeking evidence-based practices to improve social communication and interaction in secondary school students with ASD. The results of this study suggest that PRT has the potential to increase a critical social skill (i.e., question asking) in adolescents with ASD when implemented in the school setting. However, given the mixed results, it should currently be used with caution.

This study suggests that secondary education providers who participate in a brief training package consisting of didactic instruction and video feedback can improve in their use of PRT strategies, though may struggle to achieve the criterion for fidelity. This training can be implemented in a range of secondary school settings (i.e., a typical high school, an external transition program) in a way that accommodates the complex scheduling needs of schooling at this level. This reflects a primary goal of this study, which was to bring PRT into school settings in a way that was useful to educators and students, and realistic for the unique structure of secondary school environments.

Implications for Research. PRT is an evidence-based practice that is grounded in decades of empirical support. However, almost none of this research has included older students (i.e., adolescents/young adults) in its sample. This study contributes to the literature by testing the intervention with a sample consisting entirely of adolescents with ASD. The results of this study suggest that adolescent students with ASD may respond positively to PRT, even when not implemented with fidelity. Additionally, this study seeks to begin to address another important gap in the literature: specifically, the implementation of PRT in the secondary school setting. Few studies have examined the use of PRT in any school setting (Kowitt et al., in preparation)
and this is an important issue because bringing evidence-based practices into schools is a matter of high priority (Stahmer, Collings, & Palinkas, 2005). Although a few studies have examined PRT implementation in elementary schools, no other studies have used PRT in secondary schools. As such, this study is an important first step in bringing PRT to adolescents with ASD in their natural educational environment.

While the study found no functional relation between PRT and student targeted question initiations, the results do suggest the potential promise for future research (see Directions for Future Research section below). Indeed, the results generate many interesting questions for future research, the answers to which may improve education provider training enabling PRT to be implemented with fidelity in secondary schools, which may possibly result in improved question-asking behavior in students with ASD.

This study further contributes to a line of research that has highlighted and elucidated the challenges of bringing evidence-based practices from elementary and middle school settings into the secondary schools. For example, Freeman et al. (2018) sought to replicate in the secondary setting a targeted professional development procedure to improve classroom management, which had been successfully implemented in the elementary setting. However, several elements unique to secondary schools made it challenging to replicate these results with desired effect in the high school setting. The researchers hypothesized that differences in pre-service preparation for secondary teachers compared with elementary teachers, block scheduling, and a semester format all impacted the ability to successfully replicate the study. Similarly, in this study, elements of the secondary school structure presented challenges for implementation. The school in which Education Providers 2 and 3 both worked had a complex rotating schedule. This made it challenging to schedule the regular data collections necessary for rigorous single case design
research. As such, there was variability in the data collection schedule leading to some weeks with only one data collection and sessions taking place at different days, times, and locations over the course of the study duration (see “Limitations” section). Greater understanding of the factors that make research in secondary schools challenging is a useful addition to the research literature and should impact future research in this area.

The results of this study suggest that the education provider training package may need to be altered and tested to meet the needs of diverse education providers. The results of this study suggest that paraprofessionals with no formal background in ABA may need more or different training to be able to implement PRT with fidelity. Previous studies examining paraprofessional use of PRT have not taught or coded for all PRT strategies. Both Feldman and Matos (2013) and Robinson (2011) only provided instruction in and coded for the following four PRT strategies: clear opportunity, child choice, contingent reinforcement, and natural reinforcement. As such this study held paraprofessionals to a higher standard than in previous research. The results suggest that a paraprofessional with no prior experience with ABA may benefit from changes to the training model. Possible changes to the training include (a) the use of videos of adolescents with ASD receiving PRT (in this study, the available videos for training involved only younger students); and (b) more opportunities for modeling and practicing with the principal investigator. Additionally, education providers may benefit from more instruction in how to set up PRT activities. Education providers struggled to provide clear directions to their students about the activities they were doing together during intervention sessions. This led to lost opportunities for student question asking and required the education provider to give clarifying directions, which lowered their fidelity score and confused students. Expanded training and modeling in this area
could help future education providers, as could scripts that education providers could use to explain activities to students.

Finally, this study contributes to the literature through its use of Tau-U analysis. Typically, this metric for calculating and evaluating effect size in single case design has been used to examine adjacent baseline and intervention phases. However, given the video feedback phase in this study design, it was used to contrast baseline and video feedback phases, video feedback and intervention, and baseline and intervention phases. This provided an unusual opportunity to examine and compare Tau-U across these contrasts.

**Directions for Future Research**

The results of this study suggest several opportunities for future research. As noted above, this study involved a heterogeneous education provider sample to meet the needs of participating schools. Future research should narrow this sample by examining PRT implementation by only paraprofessionals or only special education teachers, for example. Narrowing the sample characteristics may make it possible to isolate why training may be effective for some education providers and not for others. Greater understanding of these variables would open up a new line of research focusing on different elements of training or supports that struggling education providers could receive as part of their training. In addition, as mentioned above, it is possible that something about the teacher-student relationship was different than the paraprofessional-student relationship, which impacted the results. The small sample size for this study makes it impossible to explore this question further. However, future studies using different research designs and larger samples may be able to shed light on this issue.
A related line of future research should explore the use of a modified training package for use with education providers who have no prior knowledge or experience with ABA. Specifically, training in future studies could spend more time teaching the hierarchy of PRT prompts and provide more modeling. It could include clearer and more detailed instruction in setting up PRT activities, and more opportunities for education providers to practice these before they begin working with students. Future research should also consider additional supports that could be provided to education providers who continue to struggle to achieve the criterion for fidelity after a fixed number of sessions in the intervention phase. For example, in a prior study, Feldman and Matos (2013) provided in vivo feedback to paraprofessionals as they utilized PRT strategies to facilitate social interactions. Future research could use in vivo feedback (rather than or in addition to video-based performance feedback) to allow education providers to make immediate adjustments to their practice. Future research could also include enhanced supports such as scripts that education providers could use to introduce the rules or procedures for PRT activities. This was an area of struggle for all of the education providers in this study, in particular Education Providers 1 and 3. Simple scripts would easily mitigate this area of challenge, allowing education providers to focus on improving their implementation of the PRT strategies themselves.

The present study ended with the conclusion of the academic year. As such, the intervention phase was cut short for one of the participating pairs (i.e., Pair 1). Future research should examine change in education provider fidelity and student behavior during an extended intervention phase. This would allow for greater understanding of how gradual improvement in PRT fidelity over time impacts student behavior. The conclusion of the academic year also meant that there was no opportunity to collect maintenance data as was originally planned.
Future research would benefit from including a follow-up phase to examine whether the skills learned by the education providers and students were maintained over time. Additionally, future research should explore the student generalization of the dependent variable. Do students who have increased their use of question asking in the context of PRT, also exhibit increased question-asking behavior in other contexts when PRT is not taking place? Do they use more questions in other classrooms with other educators or with peers? Examination of generalization is particularly important given the struggles of many students with ASD in this area (Rimland, 1964). An additional area of interest might be the ability for education providers to generalize the use of PRT strategies with other students.

Finally, future research would benefit from extending the examination of social validity. This study collected social validity data from education providers only. In the future, it would be informative to collect social validity data from students as well. One of the foundational principles of PRT is that it takes place in the context of inherently motivating activities for the student. As such, it would be useful to know if students found the activities motivating or enjoyable.

Conclusions

By definition, individuals with ASD struggle with social communication and social interaction, one component of which is question-asking behavior. In addition, adults with ASD have poor outcomes in critical areas such as independent living, postsecondary education, and employment, all of which require social interaction for success. PRT is an evidence-based practice that has been found to effectively increase question-asking behavior but has most often been used and tested in the clinical setting and with young children with ASD. This study sought to expand the use of PRT with adolescents with ASD and into the secondary school setting. This
study found no functional relation between PRT implementation and student use of targeted question initiations. Results of this study indicated that education providers were able to increase their use of PRT strategies after training, but in general were not able to achieve the criterion for fidelity of implementation (i.e., 80%). Despite these mixed results, this study suggests that there is promise in future research exploring the use of PRT with adolescents in the secondary school setting. Although three instances of change are required to demonstrate a functional relation, two students demonstrated clear effects. Future research should prioritize alterations to the training package to accommodate education providers with limited base knowledge of ABA, as well as collection of maintenance and generalization data. Regardless of direction, future research in this area is a matter of priority in order to expand understanding of how to improve social interaction and communication in adolescents with ASD with the hope of ultimately making a positive difference in adult outcomes.
References


**Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C., §1400 et seq.**


Appendix A

PRT Strategies, Definitions, and Examples
<table>
<thead>
<tr>
<th><strong>PRT Strategy</strong></th>
<th><strong>Definition</strong></th>
<th><strong>Example</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Attending</td>
<td>The implementer must have the child’s attention prior to presenting an opportunity.</td>
<td>The child is looking in the direction of the implementer; the child is not engaged in an activity independent of the implementer.</td>
</tr>
<tr>
<td>Clear opportunity</td>
<td>The discriminative stimulus is clear and appropriate to the task.</td>
<td>The implementer provides a question, instruction, or opportunity to respond that makes sense within the context of the activity.</td>
</tr>
<tr>
<td>Interspersal of maintenance and</td>
<td>Acquisition (new) tasks are interspersed with maintenance tasks (ones the child already knows).</td>
<td>The child is learning to ask “where” questions, but already knows “what” questions. While working on the former, the implementer intersperses trials for (and reinforces successful attempts of) the latter.</td>
</tr>
<tr>
<td>acquisition tasks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple cues</td>
<td>The discriminative stimulus should involve the use of multiple cues.</td>
<td>Asking the child if s/he wants the red pencil or the blue pencil (rather than just the pencil).</td>
</tr>
<tr>
<td>Child choice</td>
<td>To the greatest extent possible, the implementer should follow the child’s choice of activities and tasks.</td>
<td>Giving the child the choice between two games to play.</td>
</tr>
<tr>
<td>Contingent reinforcement</td>
<td>Reinforcement must be based on and immediately follow the child’s behavior.</td>
<td>Giving the child the toy immediately after the child has said “toy.”</td>
</tr>
<tr>
<td>Natural reinforcement</td>
<td>Reinforcement should be directly related to the behavior.</td>
<td>Giving the child the ball after the child says “ball.” Not, giving the child an edible reinforce after the child says “ball.”</td>
</tr>
<tr>
<td>Reinforcement of attempts</td>
<td>Any goal-directed attempt to respond to a question or instruction should be reinforced, regardless of 100% accuracy.</td>
<td>Giving the child the ball after the child says “ba.” Not requiring the child to say “ball” to receive reinforcement.</td>
</tr>
</tbody>
</table>

*Note.* Definitions from R. L. Koegel and Koegel (2006). Strategies are presented in the order that corresponds with the PRT Fidelity of Implementation Scoring Sheet.
Appendix B

Characteristics of Studies Included in Systematic Literature Review by Kowitt et al. (in preparation)
### Characteristics of Studies Included in Systematic Literature Review by Kowitt et al. (in preparation)

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>n</th>
<th>Age in years</th>
<th>Implementers</th>
<th>Intervention setting</th>
<th>Dependent variables for students with ASD</th>
<th>Dependent variables for implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feldman &amp; Matos, 2013</td>
<td>Single case design (multiple baseline across participants)</td>
<td>3</td>
<td>5–8</td>
<td>3 paraprofessionals</td>
<td>Lunch, recess/ playground, and/or other activities (i.e., art, board games)</td>
<td>Reciprocal social behavior</td>
<td>Implementer behaviors, satisfaction, fidelity of implementation</td>
</tr>
<tr>
<td>Harper, Symon, &amp; Frea, 2008</td>
<td>Single case design (multiple baseline across participants)</td>
<td>2</td>
<td>8–9</td>
<td>6 typically developing peers, ages 8–9 years</td>
<td>Recess/ playground</td>
<td>Reciprocal social behavior</td>
<td>Fidelity of implementation</td>
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<td>Clinic, home, or school resource room</td>
<td>Language, play, reciprocal social behavior</td>
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Appendix C

PRT Fidelity of Implementation Scoring Sheet
# PRT Fidelity of Implementation Scoring Sheet

Recording Name: ____________________________  
Coder: ________________________  
Date Coded: ____________

<table>
<thead>
<tr>
<th>Opportunity</th>
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<th>Clear Opportunity</th>
<th>Child Choice</th>
<th>Maintenance/ Acquisition Tasks</th>
<th>Contingent Reinforce</th>
<th>Natural Reinforce</th>
<th>Reinforce Attempts</th>
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Instructions
1. Score fidelity for each opportunity instigated by the person implementing PRT.
2. Score each category as
   + (plus): the person being observed utilized this component of PRT
   - (minus): the person being observed did not use this PRT component
   N/A (not applicable): the scorer is not familiar with the student (e.g., to know which tasks are maintenance tasks)
3. The performance of the person being observed is independent of the child’s response.
4. The person being observed must score 80% in each category to meet fidelity.

*Note:* Adapted from R. L. Koegel & Koegel, 2006.
Appendix D

Definitions of Opportunity for Purposes of Coding PRT Fidelity of Implementation
**Definition of Opportunity for Purposes of Coding PRT Fidelity of Implementation**

To be considered an opportunity, the education provider’s utterance must be one of the following:

<table>
<thead>
<tr>
<th>Utterance type</th>
<th>Definition</th>
<th>Example</th>
<th>Non-examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct question</td>
<td>Closed, moderately closed, or open ended questions appearing in standard form and containing one or more of the following: (a) begins with an interrogative word (i.e., who, what, where, when, why, how); (b) inverted subject-verb order (e.g., Is she going to the bank?, in contrast to She is going to the bank); or, (c) use of upward voice intonation AND Be followed by either a student response OR three or more seconds of wait time.</td>
<td>The education provider asks, “What color crayon do you want?” followed by three seconds of wait time.</td>
<td>The education provider asks, “What color crayon do you want?”,” waits two seconds, and then asks “What piece do you want?” (no wait time and no student response).</td>
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<tr>
<td>Declarative utterance</td>
<td>An utterance with an information seeking function, followed by either a student response OR three or more seconds of wait time.</td>
<td>The education provider says “I want you to tell me about your pet cat,” and the student immediately talks about his pet cat.</td>
<td>The education provider says “I want you tell me about your pet cat,” waits two seconds, and then asks “What color is your cat?” (the declarative utterance is followed by insufficient wait time).</td>
</tr>
<tr>
<td>Discrete comment</td>
<td>A complete thought followed immediately by a student response OR three or more seconds of wait time. Reponses to student questions that simply answer the question are NOT included. One-word statements and non-word vocalizations (e.g., grunts, “hmmm”) are not included.</td>
<td>The education provider says, “I did something really fun this weekend,” and waits three seconds for the student to respond.</td>
<td>The student asks, “Is it your turn?” and the Education Provider replies “no.” (The education provider’s response is not a new opportunity to respond).</td>
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<td>The student says he wants to play checkers and the education provider replies, “okay.”</td>
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<td>Three or more seconds of wait time</td>
<td>The education provider does not speak or present materials for greater than or equal to three seconds, providing opportunity for the student to make a statement or ask a question. This does not include times when the education provider is waiting for the student to complete a task or activity.</td>
<td>The education provider holds all of the pieces of a Mr. Potato Head game. She sits for four seconds until the student says “I want a piece.”</td>
<td>The education provider waits for eight seconds while the student laces a bead onto a piece of string.</td>
</tr>
</tbody>
</table>
Appendix E

Question Initiations Definitions, Examples, and Non-Examples
Question Initiations Definitions, Examples, and Non-Examples

Targeted Question Initiations. The total number of targeted questions asked by the student within the first 15 minutes of recorded activity (i.e., business as usual at baseline, or PRT in intervention phase) will be counted. To be considered a target question initiation, the student must ask a question that (a) begins with one of the three target stems (i.e., who, what, or where), (b) makes sense given the context of the interaction, and (c) is not modeled by the implementer. Student self-corrections will be counted as correct use of a targeted question initiation.

Untargeted Question Initiations. Data on the total number of novel, untargeted questions posed by the student within the first recorded 15 minutes of educational activity will be collected to evaluate general improvements in the skill of question-asking (R. L. Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). This will include questions types not taught as part of the intervention (i.e., questions that do not begin with who, what, and where) and that make sense given the context of the interaction. For example, if the student and implementer are working on a craft project together and the student asks “How did you do that?,” then this question would be considered an untargeted question initiation. In contrast, if given the same scenario, the student were to ask “what did you do this morning?” or “do you like cheeseburgers?,” these questions would not be counted as untargeted question initiations because it begins with a taught stem or is off-topic, respectively.

Examples and non-examples of targeted question initiations

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Example</th>
<th>Non-Example</th>
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<tr>
<td>Begins with one of the three target stems</td>
<td>The student has completed a step in the craft project she is working on and the implementer has the directions. The student asks, “What do we do next?”</td>
<td>The student has completed a step in the craft project she is working on and the implementer has the directions. The student asks, “Do you like it?” <em>(This is an example of an untargeted question initiation).</em></td>
</tr>
</tbody>
</table>
| Makes sense given the context of the interaction | The student has completed a step in the craft project she is working on and the implementer has the directions. The student asks, “What do we do next?”  
In conversation, the implementer says, “I like to go to the zoo.” The student replies, “What zoos have you been to?” | The student has completed a step in the craft project she is working on and the implementer has the directions. The student asks, “Where do we do next?”  
In conversation, the implementer says, “I like to go to the zoo.” The student replies, “Do you like birthday cake?” *(This is an off-topic question and counts as neither a targeted or untargeted question initiation).* |
| Unprompted by implementer                     | Implementer says, “I went somewhere interesting yesterday.” Without further prompting, student replies, “Where did you go?” | Implementer says, “I went somewhere interesting yesterday.” Student does not reply. Implementer says, “I said I went somewhere interesting yesterday. What could you ask me?” |
Appendix F

Student Behavior Observation Tool and Assessment
Student Behavior Observation Tool and Assessment

<table>
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<th>Minute</th>
<th>Student Behavior Tally</th>
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Appendix G

Implementer Satisfaction Questionnaire
### Implementer Satisfaction Questionnaire

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<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>I feel satisfied with the training I received as part of this study.</td>
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<tr>
<td>The strategies I learned benefited my assigned student.</td>
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<td>I enjoyed using these strategies with my student.</td>
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<td>I will continue to use these strategies with my student.</td>
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<td>I will use these strategies in the future with other students.</td>
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<tr>
<td>I felt comfortable being video recorded as part of the study.</td>
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<td>I felt comfortable receiving feedback on my use of the strategies.</td>
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<tr>
<td>I would recommend this training to others.</td>
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</table>

The training you received consisted of three parts: introductory lesson about PRT, modeling, and video feedback. What as the most helpful part of the training?

Were there any parts of the training that you found unhelpful?

Do you have any suggestions for improving the training in the future?

Do you have any concerns about the techniques you learned?

Is there anything else you would like to tell me about your experience with this study or what you learned?

*Note: Form based on Feldman & Matos (2013) and Robinson (2011).*
Appendix H

PRT Strategies, Definitions, Examples, and Non-Examples Handout
<table>
<thead>
<tr>
<th>PRT Strategy</th>
<th>Definition</th>
<th>Example(s)</th>
<th>Non-Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child attending</td>
<td>The implementer must have the student’s attention prior to presenting an opportunity.</td>
<td>The student is looking in the direction of the implementer; the student is not engaged in an activity independent of the implementer.</td>
<td>The student is not looking at the implementer.</td>
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<td></td>
<td></td>
<td>The student is talking to him/herself and is not engaged with the implementer.</td>
<td></td>
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<tr>
<td>Clear opportunity</td>
<td>The discriminative stimulus is clear and appropriate to the task. The opportunity may be verbal or nonverbal.</td>
<td>The implementer provides a question, instruction, or opportunity to respond that makes sense within the context of the activity.</td>
<td>The implementer abruptly changes the topic of conversation.</td>
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<tr>
<td></td>
<td></td>
<td>The implementer holds onto all the game pieces and the student must ask for a piece to proceed with playing the game. (The implementer may set up the environment to prompt the response).</td>
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<tr>
<td>Child choice</td>
<td>To the greatest extent possible, the implementer should follow the student’s choice of activities and tasks. Whenever possible, incorporating student-preferred activities or conversation topics.</td>
<td>Giving the student the choice between two board games to play.</td>
<td>Telling the student which activity they are going to do that day.</td>
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<td></td>
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<td></td>
<td>Only selecting teacher-preferred activities or conversation topics as options.</td>
</tr>
<tr>
<td>Interspersal of maintenance and acquisition tasks</td>
<td>Acquisition (new) tasks are interspersed with maintenance tasks (ones the student already knows).</td>
<td>The student is working on asking “where” questions, but already knows “what” questions. While working on the former, the implementer intersperses trials for (and reinforces successful attempts of) the latter.</td>
<td>The implementer only provides opportunities for the student to ask “where” questions.</td>
</tr>
<tr>
<td>Contingent reinforcement</td>
<td>Reinforcement must be based on and immediately follow the student’s behavior.</td>
<td>Giving the student the piece to the board game immediately after the student has said, “where is my piece for the game?”</td>
<td>The student asks, “where is my piece for the game?” and the instructor asks the student what color the piece is before giving him the piece.</td>
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<tr>
<td>Natural reinforcement</td>
<td>Reinforcement should be directly related to the behavior.</td>
<td>Giving the student the piece to the board game immediately after the student has said, “where is my piece for the game?”</td>
<td>The student asks, “where is my piece for the game?” and receives a candy as reinforcement.</td>
</tr>
<tr>
<td>Reinforcement of attempts</td>
<td>Any goal-directed attempt to respond to a question or instruction should be reinforced, regardless of 100% accuracy.</td>
<td>The implementer says, “I saw a good friend this weekend” and the student responds, “Who did I see?” The student receives reinforcement although the sentence is not grammatically correct.</td>
<td>The implementer says, “I saw a good friend this weekend” and the student responds, “Who did I see?” The instructor corrects the student’s grammar and does not provide reinforcement.</td>
</tr>
</tbody>
</table>

*Note.* Definitions from R. L. Koegel and Koegel (2006). Strategies are presented in the order that corresponds with the PRT Fidelity of Implementation Scoring Sheet.
Appendix I

Interest in Study Participation Form
Interest in Study Participation

**Study Title:** Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study  
**Principal Investigator:** Joseph Madaus, Ph.D.  
**Student Researcher:** Jennifer Kowitt, M.A.

☐ I am interested in learning more about this study. Please contact me!

Name: ____________________________

School: ____________________________

Email address: ____________________________

Phone number: ____________________________

☐ I am not interested in participating in this study.
Appendix J

Educator Consent Form
Consent Form for Participation in a Research Study

Principal Investigator: Joseph Madaus, Ph.D.
Student Researcher: Jennifer Kowitt, M.A.
Study Title: Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study

Introduction

You are invited to participate in a research study to explore the effectiveness of an intervention to teach question-asking to adolescents and young adults with Autism Spectrum Disorders (ASD). Question-asking is considered a critical skill, which can help students to seek help when needed, engage in conversation with others, and to develop vocabulary. However, many students with ASD struggle to ask questions and may need explicit instruction to develop this skill. You are being asked to participate in this study because you are an education provider who currently works with students with ASD aged 14–21 years in a public 9-12th grade high school, a transition program housed within the school, or an external transition program run by the local education agency.

Why is this study being done?

The purpose of this research is to examine whether an intervention called Pivotal Response Treatment (PRT) can help high school students with ASD to develop their question-asking skills. Many research studies have found that PRT can help younger students with ASD improve in critical areas, including question-asking. PRT provides opportunities for learning within the child’s natural activities and environment. To increase motivation, its sessions are designed around the interests of the individual child.

In the past, PRT has mostly been tested with younger children with ASD. This study is unique because it will explore how older students with ASD respond to PRT. In addition, previous studies have mostly examined the effects of PRT when it is used in a clinic, but not in a school. In this study, we want to learn if people working in a school (for example, teachers or paraprofessionals) can learn to use PRT to help their secondary students with ASD.

What are the study procedures? What will I be asked to do?

If you agree to take part, there are three parts of this study in which you will participate. In each part, you will be paired with a student with ASD from your regular work setting. You will work with this student for the entire study. In the first part of the study:
• We will identify the topics or activities of interest to the student. To do this, we will speak with you, other education providers, the student’s parents, and/or the student. We will use this information to design activities that the student is likely to find motivating.
• We will ask you some questions to get more information about you and your background (e.g., number of years teaching, race/ethnicity).
• We will video record you working with your student in the way that you normally do in school (seven or more times for 15 minutes). Video recordings will be used for data collection and analysis purposes.

During the second part of the research study:
• The student researcher will teach you how to do PRT and how to teach your student certain types of questions. This will take 2–2.5 hours. Training may take place in one session or over multiple sessions to accommodate your schedule.
• After you receive this training, the student researcher will video record you doing PRT with your student and will provide feedback (at least three times, 45 minutes/session).
• All training sessions will be video recorded for data collection and analysis purposes. You will also watch your videos to help you improve your practice.

During the third part of the study:
• You will use PRT to help your student develop his/her question-asking skills (five or more times for 45 minutes each).
• You will be asked to fill out a questionnaire letting us know how you feel about the training and what you learned.
• About four weeks later, we will return to record you using PRT with your student (1–2 times for 45 minutes).

What other options are there?

It is your choice to participate in this study. If you choose not to participate, you will participate in your regular classroom activities.

What are the risks or inconveniences of the study?
• One possible risk is a breach of confidentiality. The following procedures will be used to protect your confidentiality. Only members of the research team will have access to raw data. Identification numbers will be assigned and used for all participants at all times and on all documents (with the exception of contracts and consent forms). A code sheet of identifying numbers will be maintained in a separate and secure location. All electronic data will be stored on password-protected devices and maintained on a secure server. Video data will be transferred from the recording device to the secure server before the device leaves your school.
• You may experience low levels of anxiety or stress during video-recorded sessions, training, and implementation. This may be attributed to learning something new and/or being video/audio recorded. You may immediately
terminate any activity at any time and without penalty. Likewise, you may immediately withdraw from the study at any time without penalty.

- Participation may take you away from normal school activities. The amount of time required to participate may be an inconvenience. You may immediately end any activity at any time and without penalty. Likewise, you may immediately withdraw from the study at any time without penalty.

What are the benefits of the study?

Through this study, you may learn a technique that may help the students with whom you work. You may continue using this technique in the future when you work with other students with ASD. We believe that the results from this study will contribute to the limited literature on how to teach this important skill to high school students with ASD.

Will I receive payment for participation? Are there costs to participate?

As an acknowledgement of your time and effort, at the completion of the study you will receive a $25 gift card to Starbucks. There are no costs to you for participating in this study.

How will my personal information be protected?

The following procedures will be used to protect the confidentiality of the data we collect. Only members of the research team will have access to raw data. Identification numbers will be assigned and used for all participants at all times and on all documents (with the exception of the signed forms). A code sheet of identifying numbers will be maintained in a separate and secure location. All electronic data will be stored on password-protected devices and maintained on a secure server. Video data will be transferred from the recording device to a secure server before leaving the school. Raw data and electronic data will be stored in secured locations for 3 years as data are being analyzed and published. We will do our best to protect the confidentiality of the information we gather but we cannot guarantee 100% confidentiality.

For training purposes, you will have access to video recordings of yourself doing PRT. Video recordings will not be shared with parents, school officials, or other educators. At the conclusion of the study, parents, school officials, and other educators may have access to a summary of the results. The researchers will provide school officials (e.g., principals) with this summary. They will also contact parents, participating education providers, and supervising teachers to see if they are interested in receiving a summary of the results. Results will be de-identified and participant names will never accompany the results. The researchers may publish their findings after completing the study. Information will be presented in summary format and your name and the name of your school will not be identified in any publications or presentations.
If, during the course of this research study, a UConn employee suspects that a minor (under the age of 18) has been abused, neglected, or placed at imminent risk of serious harm, it will be reported directly to the Department of Children and Families (DCF) or a law enforcement agency.

You should also know that the UConn Institutional Review Board (IRB) and Research Compliance Services may inspect study records as part of its auditing program, but these reviews will only focus on the researchers and not on your responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Can I stop being in the study and what are my rights?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

Your principal and supervising teachers have approved this study. Participation in this study will be considered part of your regular working hours. However, you should not feel any pressure to participate in this study. Participating in this study is entirely your choice and participation will not impact your job status in any way.

Whom do I contact if I have questions about the study?

Take as long as you like before you make a decision. We will be happy to answer any questions you have about this study. If you have further questions about this study or if you have a research-related problem, you may contact the principal investigator, (Joseph Madaus, 860-486-2785) or the student researcher (Jennifer Kowitt, 908-419-2418). If you have any questions concerning your rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.

Documentation of Consent:
I have read this form and decided that I will participate in the project described above. Its general purposes, the particulars of involvement and possible risks and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time. My signature also indicates that I have received a copy of this consent form.

Participant Signature: _____________________________ Print Name: _____________________________ Date: _____________________________

Signature of Person Obtaining Consent: _____________________________ Print Name: _____________________________ Date: _____________________________
Appendix K

Educator Behavior Contract
Educator Behavior Contract

I, ____________________________, understand that before I receive training in Pivotal Response Treatment (PRT) I must read and discuss the following guidelines with Jennifer Kowitt, the student researcher for this study. I understand that adhering to these guidelines is important for maintaining the integrity of the study and that if I do not, I may prevent the study from working.

In order to protect the rigor of the study, I:

1. Will not discuss or model any aspect of the training I am about to receive with any of my colleagues (regardless of whether they are in the study) or with any educators who work at another school.

2. Will not discuss or demonstrate any aspect of the intervention, including the strategies and techniques, I have learned with any of my colleagues (regardless of whether they are in the study) or with any educators who work at another school.

3. Will only use the techniques I learn with the student to whom I have been assigned.

4. Will only use the techniques with my assigned student during scheduled video-recorded sessions.

5. I will keep private the target skills that my student is working on (i.e., question-asking).

6. I will not discuss my student’s progress with any of my colleagues.

7. I will keep all aspects of the study confidential for the duration of the study.

I understand and agree to the guidelines listed above. I have asked any questions I currently have about the guidelines and if I have questions in the future, I will contact Jennifer Kowitt (908-419-2418, jennifer.kowitt@uconn.edu). I understand that at the conclusion of the study, I may share what I have learned with any of my colleagues.

______________________________
Name (print)

______________________________
Signature

______________________________
Date
Appendix L

Parent Introductory Letter
Dear Parent(s) or Guardian(s),

We are seeking participants for a pilot research study of an intervention for adolescents who struggle with the skill of question-asking. Your child’s teacher has identified your son/daughter as a student who struggles with this skill and your school has kindly given us permission to share information about our study with you. Participation in this study is purely optional.

Your child’s participation in the pilot study will help us to understand whether an intervention called Pivotal Response Treatment can help high school students with Autism Spectrum Disorders (ASD) improve their question-asking skills. While much research has found Pivotal Response Treatment to be an effective way to teach social skills (including question-asking) to younger students with ASD, it has not been tested before in a high school setting. Through this study, we hope to find a way to help adolescents and young adults with Autism Spectrum Disorders learn this critical skill.

Education providers at your child’s school will be trained to provide Pivotal Response Treatment. We will video record your child working with a trained education provider. We also seek permission to access your child’s school records so that we can learn more about participants.

Following, you will find a full description of the study as well as a consent form. Please contact Jennifer Kowitt, the student researcher for this study, with any questions (jennifer.kowitt@uconn.edu or 908-419-2418).

Thank you for your consideration,

Principal Investigator:
Joseph Madaus, Ph.D.
Department of Educational Psychology, University of Connecticut

Student Researcher:
Jennifer Kowitt, M.A.
Department of Educational Psychology, University of Connecticut
Appendix M

Parent Consent Form
Parental Permission Form for Participation in a Research Study

Principal Investigator: Joseph Madaus, Ph.D.  
Student Researcher: Jennifer Kowitt, M.A.  
Study Title: Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study

Introduction

Your child is invited to participate in a research study because he/she is a student with Autism Spectrum Disorders (ASD) who has been identified by his/her teacher as a student who struggles with the skill of question-asking. Question-asking is considered a critical skill, which can help students to seek help when needed, engage in conversation with others, and to develop vocabulary. However, many students with ASD struggle to ask questions and may need explicit instruction to develop this skill.

In order to be eligible to participate in this study, your child must: (a) have a diagnosis of Autism Spectrum Disorders, (b) have an IQ of 50 – 100 (c) speak in at least simple sentences, (d) be enrolled in a public secondary school, (e) be aged 14–21 years, and (f) be identified by their teacher as having difficulty independently asking basic questions (e.g., unprompted and relevant who, what, and where questions). You are receiving this form because your child’s teacher has identified him/her as meeting these criteria and because an education provider with whom your child works has expressed interest in participating in this study.

Why is this study being done?

The purpose of this research is to examine whether an intervention called Pivotal Response Treatment can help high school students with ASD to develop their basic question-asking skills. In the past, Pivotal Response Treatment has mostly been tested with younger children with ASD and never in a high school setting. The research studies done in the past have found that Pivotal Response Treatment can help younger students with ASD improve in critical areas, including question-asking. Pivotal Response Treatment provides opportunities for learning within the child’s natural activities and environment. To increase motivation, its sessions are designed around the interests of the individual child.

This study is unique because it will explore how older students with ASD respond to Pivotal Response Treatment. In addition, previous studies have mostly examined the effects of Pivotal Response Treatment when it is used in a clinic, but not in a school. In this
study, we want to learn if people working in a school (for example, teachers or paraprofessionals) can learn to use Pivotal Response Treatment to help their students.

What are the study procedures? What will my child be asked to do?

For your child, there are two parts to this research study. In both parts, your child will be paired with a teacher, paraprofessional, or other education provider from their regular classroom. They will work with this education provider for the entire study. In the first part of the study:

- We will identify the topics or activities of interest to your child. To do this, we will speak with your child’s teacher(s), you, and/or your child. We will use this information to design activities that your child will find motivating.
- We will review the study requirements with your child and confirm that they would still like to participate.
- We will video record your child working with their education provider in the way that they normally do in school (seven or more times for 15 minutes).
- From the video recordings, we will count the number of times your child asks questions, in particular the number of times your child asks questions beginning with who, what, or where.

During the second part of the research study:

- Your child will learn about when to use questions beginning with who, what, or where.
- The researcher will train your child’s education provider to use Pivotal Response Treatment. Your child’s education provider will then use Pivotal Response Treatment to help your child develop his/her question-asking skills (five or more times for 45 minutes).
- Training sessions will take place at a time when your child would typically be working on skill development. It will take place in your child’s regular educational environment.
- All training sessions will be video recorded.
- From the video recordings, we will count the number of times your child asks questions.
- About four weeks later, we will return to record your child’s education provider using Pivotal Response Treatment with your child (maximum two times for 45 minutes). Videos will be used for data collection and analysis purposes.

If you agree to participate in the study, the research team will access your child’s school records, including demographic information and information about your child’s school performance and functioning. Information collected will include demographic information (e.g., age, race/ethnicity, gender, disability diagnosis), intelligence testing, academic achievement, psycho-educational reports, functional behavioral assessments, and IEP goals and objectives. Highly sensitive personal information will not be recorded. Only records for the past five years will be reviewed.
What other options are there?

If your child chooses not to participate he/she will participate in regular classroom activities.

What are the risks or inconveniences of the study?

- One possible risk is a breach of confidentiality. The following procedures will be used to protect the confidentiality of your child’s data. Only members of the research team will have access to raw data. Identification numbers will be assigned and used for all participants at all times and on all documents (with the exception of consent forms). A code sheet of identifying numbers will be kept in a separate and secure location. All electronic data will be stored on password-protected devices and maintained on a secure server. Video recordings will be transferred from the recording device to the secure server before leaving the school.
- Students may experience low levels of anxiety or stress during video-recorded sessions, training, and implementation. This may be attributed to learning something new and/or being video/audio recorded. Students may immediately stop any activity at any time and without penalty. Likewise, they may immediately withdraw from the study at any time without penalty.
- A possible inconvenience may be the time it takes to complete the study. By allowing your child to participate in this study, he/she will not be able to participate in other school activities that may be taking place at the same time.

What are the benefits of the study?

This is a research study testing an intervention to determine whether it will help students with ASD improve their question-asking skills. While we cannot guarantee that participation will improve the use of this skill, we hope that through this study, your child will increase his/her use of question-asking in their interactions with others. We also believe that the results from this study will contribute to our knowledge of how to teach this important skill to high school students with ASD.

Will my child receive payment for participation? Are there costs to participate?

There are no costs to you and your child for participating in this study. Your child will not be paid to participate in this study.

How will my child’s information be protected?

The following procedures will be used to protect the confidentiality of the data collected from your child. Only members of the research team will have access to raw data. Identification numbers will be assigned and used for all participants at all times and on all documents. A code sheet of identifying numbers will be maintained in a separate and secure location. All electronic data will be stored on a secure server and on password protected devices. Video data will be transferred from the recording device to a secure
server before leaving your child’s school. Raw data and electronic data will be stored in secured locations for 3 years as they are being analyzed and published. We will do our best to protect the confidentiality of the information we gather from your child but we cannot guarantee 100% confidentiality.

For training purposes, the education provider to whom your child has been assigned will have access to video recordings. Video recordings will not be shared with parents, school officials, or other education providers. At the conclusion of the study, parents, school officials, and other teachers may have access to a summary of the results, which will not include any names or other identifying information. The researchers will contact parents to see if they are interested in receiving this summary. The researchers may publish their findings after completing the study. Information will be presented in summary format and your child and his/her school will not be identified in any publications or presentations. Results will be de-identified and participant names will never accompany the results.

If, during the course of this research study, a UConn employee suspects that a minor (under the age of 18) has been abused, neglected, or placed at imminent risk of serious harm, it will be reported directly to the Department of Children and Families (DCF) or a law enforcement agency.

You should also know that the UConn Institutional Review Board (IRB) and Research Compliance Services may inspect study records as part of its auditing program, but these reviews will only focus on the researchers and not on your child’s responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Can my child stop being in the study and what are my and my child’s rights?

Your child does not have to be in this study if you do not want him/her to participate. If you give permission for your child to be in the study, but later change your mind, you may withdraw your child at any time. There are no penalties or consequences of any kind if you decide that you do not want your child to participate.

Whom do I contact if I have questions about the study?

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this study or if you have a research-related problem, you may contact the principal investigator, (Joseph Madaus, 860-486-2785) or the student researcher (Jennifer Kowitt, 908-419-2418). If you have any questions concerning your child’s rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.
Parental Permission Form for Participation in a Research Study

Principal Investigator: Joseph Madaus, Ph.D.
Student Researcher: Jennifer Kowitt, M.A.
Study Title: Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study

Documentation of Permission:
I have read this form and decided that I will give permission for my child to participate in the study described above. Its general purposes, the particulars of my child’s involvement and possible risks and inconveniences have been explained to my satisfaction. I understand that I can withdraw my child at any time. My signature also indicates that I have received a copy of this parental permission form.

Please return this form to the child’s teacher by ____________.

Parent/Guardian Signature: ____________________________ Print Name: ____________________________ Date: ____________________________

Relationship to Child (e.g. mother, father, guardian):
______________________________

Signature of Person Obtaining Consent: ____________________________ Print Name: ____________________________ Date: ____________________________
Appendix N

Child Assent Document for Participation in a Research Study
Child Assent Document for Participation in a Research Study

Principal Investigator: Joseph Madaus, Ph.D.
Student Researcher: Jennifer Kowitt, M.A.
Study Title: Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study

Your parents have talked to you about being in a research study. Dr. Joe Madaus and Jennifer Kowitt are researchers from UCONN who want to learn more about a technique for teaching students called Pivotal Response Treatment. They want to learn if this technique can be used to teach high school students how to ask other people questions, which is a skill some students find challenging.

If you agree to participate in the study, you will work closely with one of the educators at your school who you already know. You will also learn about different kinds of questions you can ask. As part of the study, we will videotape you working with Jennifer and your teacher or paraprofessional. No information about you will be shared with anyone who is not working on this study.

You may contact Dr. Madaus (joseph.madaus@uconn.edu; 860-486-2785) or Jennifer (jennifer.kowitt@uconn.edu; 908-419-2418), or ask your parent to contact them for you, at any time if you have more questions about the study. You don’t have to be in this study if you don’t want to and no one will be upset with you if you choose not to participate. If at first you say yes, but later change your mind, you should let your parents or Jennifer know and you won’t have to be in the study any more.

You should talk to your parents about the study before you decide. This information sheet is yours to keep.
Appendix O

Research Study Photo/Video Release Form
Research Study Photo/Video Release Form

Protocol # _____TBD_____ 

Principal Investigator: Joseph Madaus, Ph.D. 

Student Researcher: Jennifer Kowitt, M.A. 

Protocol Title: Implementing Pivotal Response Treatment to Teach Question-Asking to High School Students with Autism Spectrum Disorders: A Pilot Study 

As part of this research study the University of Connecticut and those acting pursuant to its authority (“UCONN”) may record your likeness and/or voice on a particular medium (“recordings”) including but not limited to video, audio, photographic, digital, and electronic mediums during your participation in this research study. Please indicate what uses of these recordings you are willing to permit, by putting your initials next to the uses you agree to and signing the form at the end. The choice is completely up to you. We will only use recordings in the ways that you agree to. In any recording, you will not be identified by name. The photo/videos will not be used for commercial purposes. 

The recordings can be studied by the research team for use in the research project 

I understand that all such recordings, in whatever medium, shall remain the property of UCONN. My name will not be used in any publication. I agree that I will not be compensated for the use of the recordings. 

I have read the above descriptions and give my consent for the use of the recordings as indicated by my initials above. (Youth under 18 years of age must have a parent/legal guardian signature.) 

(Name, please print) 

(Signature of Subject) (Date : MM/DD/YY) 

(Parent/Guardian Signature, if participant is a minor) (Date : MM/DD/YY) 

(Signature of Person Obtaining Consent) (Date : MM/DD/YY)
Appendix P
Training and Intervention Flowchart
Training and Intervention Flowchart

Didactic training for Education Provider
• Introductory PowerPoint
• Review manual

Video feedback
• 3 sessions
• Approximately 30 mins each
• Education Provider reads one script to student about a target question stem
• Education provider implements PRT
• PI and Education Provider review videos together

PRT Implementation
• Education provider implements PRT
• PI monitors implementation fidelity
• Video feedback if necessary
Appendix Q

PRT Training PowerPoint
Pivotal Response Treatment (PRT)

- Empirically-validated behavioral treatment
- Combines applied behavior analysis (ABA) principles with motivational strategies
- Focuses on pivotal areas with widespread change in functioning
- Teaches social, communication, behavioral skills
- Emphasizes natural learning environments → generalization

Target Behaviors

Verbal
- Responsiveness
  - Question-asking/ basic and follow-up
  - Commenting
  - Initiating interactions with others
  - Expanding topics
  - Appropriate transitions between topics

Non-verbal
- Eye contact
- Posture/ use of body
- Appropriate facial expression
- Reduce inappropriate behaviors (e.g., yawning, tapping, fidgeting, etc.)
- Volume modulation

Motivation

- The most important principle
- Guiding factor in all that we do
- Facilitator of change

The Sequence: ABCs of Behavior

PRT Examples

PRT Example: Teaching language

- First Words
  - Adult prompts "truck"
  - Child says "haaaa"
  - Adult hands child truck (reinforcer)

- Phrases
  - Adult asks "what do you want?"
  - Child says "I want the markers"
  - Adult hands child the markers (reinforcer)
PRT Components:
- Child attending
- Clear opportunity
- Child choice
- Intersperse maintenance and acquisition tasks

PRT Components: Antecedent
- Child attending
  - Make sure you have the student’s attention before you begin a bid
- Child Choice
  - Children naturally select what will motivate them
  - Importance of shared control (turn-taking)
  - Flexibility
- Clear Opportunities
  - Think short, clear, concise
  - Ensure you have their (nearing) attention
- Maintenance and Acquisition
  - Children like easy tasks
  - Children like challenging tasks
  - Combine to balance motivation with learning

The Sequence

Consequences
- Immediate, contingent response
- Reinforcing attempts
- Using natural/logical reinforcement

Some tips...
- Take all antecedents (bids) to completion.
- Everything you say or do should be done with a purpose.
- Be comfortable with silence!
- Verbal praise is not enough in PRT!
- Make sure you are in charge.
- Prompting structure:
  - I just said...
  - What could you say?
  - You could say...

To Review: PRT Components
1. Child attending
2. Clear opportunity
3. Child choice
4. Intersperse maintenance and acquisition tasks
5. Immediate, contingent response
6. Reinforce attempts
7. Natural/logical reinforcement
Appendix R

Question-Asking Training Script
Question-Asking Training Script

DAY 1: WHAT

Today, I am going to teach you about questions that begin with the word *what*. I’m going to teach you about when you will use this type of question and you will have the chance to practice.

The word *what* is used when asking a question about a thing. You can ask questions that begin with *what* to get more information about a thing, activity, or an event. Here are some examples:

- What is your favorite color?
- What did you do this weekend?
- What do you want for lunch?

Now it’s your turn to think of some examples. Give me two examples of questions that begin with *what*.

Now I’ll tell you some things about myself. See if you can come up with a question that begins with the word “what” to learn more each time.

1. I really like the summer. (e.g., What do you like to do in the summer?)
2. Cooking is my favorite hobby (e.g., What do you like to cook?)
3. I am wearing my favorite color today. (e.g., what is your favorite color?)

(In each instance, if the student cannot come up with an example, the educator should prompt with the following sequence: 1) I just said [repeat question], 2) What could you ask me about [insert topic]?, 3) you could ask me [insert example question]).

So to review, *what* is for asking questions about a thing, activity, or event. When do you use questions that begin with *what*?

For the rest of our time together today, I want you to remember that you can ask me questions that begin with *what* to learn more about a thing, activity, or event.

DAY 2: WHERE

Last time, we talked about questions that begin with *what*, like “what do you like to eat for breakfast?” You use questions that begin with *what* to learn more about a thing, activity, or event. Give me one example of a question that begins with *what*.

Today we’ll talk about questions that begin with *where*. Questions that begin with *where* are used to ask someone about a place or location. Here are some examples:
Where are you from?
Where would you like to go on vacation?
Where do you go to school?

Now it’s your turn to think of some examples. What are two examples of questions that begin with *where*?

Now I’ll tell you some things about myself. See if you can come up with a question that begins with the word “where” to learn more each time.

1. I really like to visit my brother/sister. (e.g., Where does your brother/sister live?)
2. I did not grow up here (e.g., Where did you grow up?)
3. There is some place I would really like to go on vacation. (e.g., Where do you want to go?)

(In each instance, if the student cannot come up with an example, the educator should prompt with the following sequence: 1) I just said [repeat question], 2) What could you ask me about [insert topic]?, 3) you could ask me [insert example question].)

So to review, where is for asking questions about a place or location. When do you use questions that begin with where?

For the rest of our time together today, I want you to remember that you can ask me questions that begin with *where* to learn more about a place or location.

Let’s practice the two question types we have learned so far: what and where.
If I say, “I am doing something fun this weekend,” what could you ask?
If I say, “I am going out to eat tonight,” what could you ask?
[(If student does not use the correct question stem, the trainer may correct with the following relevant response:

What is for asking questions about a thing, activity, or event. Try again.
Where is for asking questions about a place. Try again.

If student does not respond or gets the question incorrect again, explain the prompt to the student (e.g., “‘I am doing something fun this weekend’ has to do with an activity. How do we start questions that have to do with an event or activity?”)]

DAY 3: WHO

So far, we have learned about questions that begin with *what and where*. You can ask questions that begin with *what* to get more information about a thing or an event. Questions that begin with *where* are used learn more about a place or location. Give me one example of a question that begins with *what* and one example of a question that begins with *where*. 

150
Today, we’re going to talk about questions that begin with *who*. The word *who* is used when asking a question about a person. You use questions that begin with *who* to find out about a person. Here are some examples:

- Who is in your family?
- Who is your favorite actor?
- Who did you hang out with over the weekend?

Now it’s your turn to think of some examples. What are two examples of questions that begin with *who*?

Now I’ll tell you some things about myself. See if you can come up with a question that begins with the word “where” to learn more each time.

1. I once met someone famous (e.g., who was it?)
2. I talked on the phone with my favorite person last night. (e.g., Who is your favorite person?)
3. I think someone in our school is really nice. (e.g., Who do you think is really nice?)

(In each instance, if the student cannot come up with an example, the educator should prompt with the following sequence: 1) I just said [repeat question], 2) What could you ask me about [insert topic]?, 3) you could ask me [insert example question].)

To review, you use questions that begin with *who* to learn about a person. When do you use questions that begin with *who*?

Let’s practice all of the question types we have learned so far: who, what, and where.

If I say, “I went somewhere fun yesterday,” what could you ask?
If I say, “I had something delicious for lunch today,” what could you ask?
If I say, “I love listening to my favorite musician on the radio,” what could you ask?

[[If student does not use the correct question stem, the trainer may correct with the following relevant response:

- What is for asking questions about a thing. Try again.
- Who is for asking questions about a person. Try again.
- Where is for asking questions about a place. Try again.

If student does not respond or gets the question incorrect a second time, explain the prompt to the student (e.g., “‘I went somewhere fun yesterday’” has to do with a place where I went. How do we start questions that have to do with a place?”)]]
Appendix S

Visual Aid for Instruction of Three Question Types
| **What** | Is for asking about a thing or an event |
| **Who** | Is for asking about a person |
| **Where** | Is for asking about a place |