Comparing the Effectiveness and Efficiency of Behavioral Skills Training and Brief Performance Feedback Interventions During the Training of Paraeducators Supporting Students with Autism Spectrum Disorders

by

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Due to the increasing number of students in need of special education services and the shortages of licensed special education personnel, paraeducators have become a critical component in the education of students with autism in school settings. Due to this, the training of paraeducators is a critical concern for human service as well as educational settings. The literature has suggested performance feedback as the most widely researched intervention to address implementation deficiencies among educators and non-professional staff in schools. In addition, performance feedback in combination with other strategies has been established as effective when training paraprofessionals. However, despite their effectiveness, such approaches may require increased time and resources, thus compromising the feasibility of paraprofessional training in school settings. Therefore, the purpose of the following study aimed to demonstrate and extend the research base regarding the effectiveness of a brief performance feedback intervention. Further, this study attempted to evaluate the efficiency of brief performance feedback interventions when compared with more comprehensive, behaviorally based training approaches (i.e., Behavioral Skills Training). Finally, this study sought to strengthen the current literature base related to the training of paraeducators by improving areas of methodological weaknesses addressed in the presented review of the available literature. Results of present study suggested similar levels of

effectiveness between the brief performance feedback intervention and Behavioral Skills Training and increased time efficiency of the brief performance feedback intervention over Behavioral Skills Training. Limitations of the current study and recommendations for future research and practice are also discussed.

Keywords: brief performance feedback, paraprofessionals, interventions, autism, school settings, special education.

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Preface

Support for this research was provided by Grant No. 04-24228 of the University of Pittsburgh, Faculty and Student Research Program, awarded to the Principal Investigator.

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1.0 Introduction

Autism spectrum disorder (ASD) is a pervasive developmental disorder characterized by three areas of impairments: social, communication, and restricted interests and behaviors (American Psychiatry Association, 2013). Over the last decade, the population of students diagnosed with ASD served under the Individuals with Disabilities Education Act (IDEA) has drastically increased (United States Government Accountability Office, 2005). Due to the communication and social impairments, as well as challenging behavior excesses, individuals affected by ASD often require intensive, specialized, and complex interventions and services (Boyle, Boulet, Scheive, Cohen, Blumberg, Yeargin-Allsopp, Visser, & Kogan, 2011; Rispoli, Neely, Lang, & Ganz, 2011) that target acquisition of skills across relevant areas of functioning (e.g., social, academic, behavioral). In addition, in order to foster generality of skills acquired, research has suggested these interventions be delivered across relevant environments for students with ASD; home, school, and/or community (Reid & Fitch, 2011). However, despite the existence of effective treatments and interventions for children with ASD and/or other intellectual disabilities, the number of people who are properly trained to deliver such treatments fails to meet the demand (Buzhardt & Heitzman-Powell, 2005). In schools, many of these interventions and/or services are delivered directly by paraeducators or other non-certified school personnel (McCulloch & Noonan, 2013).

1.1 Paraeducators

The provision of paraeducator services has been recognized as an essential component in ensuring a free and appropriate education for students with disabilities in educational settings (Etscheidt, 2005). The term paraeducator is used to describe a range of service providers who work under the supervision of certified or licensed school personnel. (Adolphson, Hawken & Stein Carroll, 2010). Other terms used to refer to this very specific group of personnel in schools include paraprofessional, classroom aide, classroom assistant, instructional aide, instructional assistant, learning support assistant, support staff, classified staff, technician, or simply assistant (Adolphson et al., 2010; Feuerborn, Tyre, & Beaudoin, 2017). Current law (Individuals with Disabilities Education Act, IDEA, 2004) stipulates that paraeducators who are appropriately trained may assist in the delivery of instruction, supervised by a special educator, and other special education services to students with ASD or other disabilities. Based on this legislative mandate, paraeducators in American schools are now charged with meeting the individualized needs of students with ASD in general and/or special education settings, not only because of the critical shortages of special education teachers, but also because the use of paraeducators is often viewed as a cost-saving measure by school administrators (Giangreco, Edelman, Broer, & Doyle, 2001; Killoran, Templeman, Peters, & Udell, 2001; Mueller & Murphy, 2001). As the number of students with ASD receiving special education services in general and special education classrooms has increased, paraeducators' level of direct involvement with students has also increased (Douglas, 2012; Giangreco & Broer, 2005; Kim, Koegel, & Koegel 2017). This rapid increase, along with other growing needs in the education of students with ASD, has led the field to place paraeducators in a direct instructional role as the existing research has suggested that some aspects of behavioral

technology and/or other instructional skills can be taught rapidly to non-specialist staff (Lavie & Sturmey, 2002).

1.2 Paraeducator Training

The training of paraeducators, or other non-certified personnel, in educational settings has been a popular topic in applied behavior analytic literature as well as in the educational literature (Brock & Carter, 2015; 2016; Neef, 1995; Parsons & Reid, 1995; Reid & Parsons, 2006). Researchers have found that without effective training, it appears that paraeducator support does not improve learning outcomes for students and may in fact be a hinderance (Giangreco, Broer, & Edelman, 1999; Giangreco, Sutter, & Doyle, 2010; Stockhall, 2014). Therefore, researchers have explored the advantages to training paraeducators to implement a variety of behavioral strategies, as well as other educational practices, and the positive outcomes this training has on both paraeducators and students (Bessette & Wills, 2007; Bolton & Meyer, 2008; Brock & Carter, 2011; Hall et al., 2010; Moore et al., 2002; Nigro-Bruzzi & Sturmey, 2010; Rosales, Stone, & Rehfeldt, 2009; Robinson, 2011; Sarokoff & Sturmey, 2008; Wood, Luiselli, & Harchik, 2007). The literature has indicated that first, training should be practical and time efficient for both trainers and trainees. Second, the training should be judged favorably by the staff. Like other behavioral interventions, acceptability by practitioners is a critical component of social validity. Finally, it should be competency focused (Kennedy, 2002; Luiselli & Russo, 2005). The methods of training, specifically with paraeducators, have included the combination or "packaging" (Wood et al., 2007) of proactive components (Fallon, Maggin, Sanetti, & Johnson, 2015) such as instructions or review of the skill to perform (Bessette & Willis, 2007; Wood et al., 2007, Hall & Macvean, 1997; Hall,

Stadnik Grundon, Pope, & Balderrama, 2010; Lavie & Sturmey, 2002; Nabeyama & Sturmey, 2010; Sarokoff & Sturmey, 2004; Sarokoff & Sturmey, 2008), demonstration of the skill or modeling (Bolton & Mayer, 2008; Codding, Livanis, Pace, & Vaca, 2008; Lavie & Sturmey, 2002; Nabeyama & Sturmey, 2010; Sarokoff & Sturmey, 2004; Sarakoff & Sturmey, 2008), rehearsal of the skill (Lavie & Sturmey, 2002; Nabeyama & Sturmey, 2010; Sarokoff & Sturmey, 2008), and reactive components (Fallon et al., 2015) such as performance feedback ([PF]; Hall et al., 2010; Robinson, 2011; Nabeyama & Sturmey, 2010; Sarokoff & Sturmey, 2004; Sarakoff & Sturmey, 2008; Schepis, Reid, Ownbey, & Parsons, 2001; Severtson & Carr, 2012). The available research base has suggested PF as a critical component in adult professional development (Mrachko & Kaczmarek, 2017).

1.3 Performance Feedback

Performance feedback (PF) has been used successfully to increase performance in a variety of organizational, educational, and human service settings (Alvero, Bucklin, & Austin, 2001). In addition, it has been the most widely researched method for increasing teacher and support staff implementation of targeted practices (Fallon et al., 2015). Hattie and Timperley (2007) conceptualized performance feedback as "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance, thus being a "consequence" of performance. Additionally, the school consultation literature has defined PF as "monitoring a behavior that is the focus of concern and providing feedback to the individual regarding a behavior (Noell et al., 2005). In schools and/or other human services settings, PF has been used to increase the treatment integrity of a prescribed intervention (e.g., behavioral and/or academic problems;

Solomon, Klein, & Politylo, 2012). Usually, during PF, the consultant, or other in the trainer or supervisory role, describes what is going well (e.g., what intervention steps are consistently implemented, any improvement in student or client outcomes) and what is going poorly (e.g., steps not implemented, steps implemented differently than planned, lack of improvement in student/client outcomes) as well as strategies to improve implementation (Fallon et al., 2015). The literature has suggested that PF can take a variety of forms (Barton & Wolery, 2007; Hattie & Timperley, 2007). For instance, PF can be provided verbally or in written form and in or out of the practice situation (Barton & Wolery, 2007; Luck, Lerman, Wu, Dupuis, & Hussein, 2018). Additionally, it can be delivered graphically (Quinn, Miltenberger, Abreu, & Narozanick, 2017) and/or through the use of technology (e.g., computers, Ipad, video; Reedy, Luiselli, & Thibadeau, 2001). Moreover, the literature has also suggested as PF, a training package that may include other antecedent and/or consequence strategies (e.g., review and feedback; review, modeling, rehearsing, and feedback, modeling and feedback; Nabeyama & Sturmey, 2010; O'keeffe, Slocum, & Magnusson, 2011). Although, there are variety of methods for delivering performance feedback, the general idea of providing PF following an observed behavior remains constant (Solomon et al., 2012).

2.0 Literature Review

Previous research regarding the implementation of PF has focused on increasing the treatment integrity of selected interventions (Codding, Feinberg, Erin, Dunn, & Pace, 2005; Codding et al., 2008; Fallon et al., 2015). Researchers have employed PF in combination with a variety of strategies when training paraeducators supporting students with ASD and/or other intellectual disabilities to implement a variety of selected interventions. For instance, performance-and-competency-based approaches (e.g., behavioral skills training [BST]; Sarokoff & Sturmey, 2004), that have been instrumental in establishing and maintaining high procedural fidelity, often include some form of instructions, modeling, rehearsal, and PF until staff meet a predetermined mastery criteria prior working with clients in-field (Matthews & Hagopian, 2014; Nigro-Bruzzi & Sturmey, 2010; Rosales, Stone, & Rehfeldt, 2009; Shapiro & Kazemi, 2017). With respect to the use of PF as a component of BST when training paraeducators supporting students with ASD in school settings, Ledford, Zimmerman, Chazin, Patel, Morales, and Bennett (2017) found that using BST (i.e., instructions, modeling, rehearsal, and feedback) served as an effective training intervention to increase fidelity of implementation of procedures when targeting appropriate social interactions of students with ASD with their peers during small group instruction. Specifically, in this study, three paraeducators were trained to make environmental arrangements to facilitate social interactions between students with ASD and their typical peers as well as prompting target social behaviors (e.g., greetings, accepting and giving materials, requesting for materials). In this study, paraeducator participants reached treatment termination (i.e., 100% implementation in at least one session and self-report of confidence that he/she could successfully implement target behaviors without the intervention) after an average of six intervention sessions across participants.

The authors reported during-session and post-session PF in the form behavior specific praise for correct implementation as well as review and corrective feedback for incorrect implementation. Similarly, Lavie and Sturmey (2002) investigated the effect of BST when training three classroom assistants working with children with ASD to conduct a paired-stimulus preference assessment. In this study, the experimenters employed a training procedure that consisted of seven steps (i.e., description of the skill, provision and description of checklist which contained target instructional behaviors, modeling of the skill via video, skill rehearsal by the participant, and approving or corrective PF). The authors of this study reported that training was conducted with each participant in two 30-40 minutes sessions. The results of this study demonstrated that the implementation of this training package was effective at teaching the three classroom assistants to conduct paired-stimulus preference assessments, in that, drastic level changes, from baseline to intervention session, were observed across participants after the first training session. Additionally, the authors indicated that participants reached mastery criteria after approximately 80 minutes of training and an average of four training sessions across participants (i.e., six, four, and two sessions respectively).

Another approach used, in combination with PF, to train paraeducators to implement various behavioral or instructional strategies for students with ASD in school settings is didactic instruction or training. Kim and colleagues (2017) found that using didactic instruction (i.e., 90-minute workshop) in combination with PF served as an effective intervention to improve the fidelity of implementation of procedures of three paraeducators when targeting socialization skills in students diagnosed with ASD. Specifically, paraeducator training consisted of an explanation of the importance of social skills training for students with ASD, incorporation of preferred interests of target students with ASD into social activities and arranging activities for appropriate

interaction between students with ASD and typically developing peers. Specific paraeducator behaviors targeted in this study included facilitating student engagement in social activities and verbal initiations of students with ASD with typical peers. Lastly, Kim et al. (2017) not only reported the positive effects of this training package when training paraeducators to target social behaviors in students with ASD, but also, the increased acceptability of paraeducator participants with respect to the training program. Similarly, in an earlier study that addressed the same issue, Koegel, Kim, and Koegel (2014) had obtained similar results, in that, the fidelity of implementation of procedures to teach socialization skills to children with autism was improved using didactic instruction and performance feedback. This study also showed collateral effects in student outcomes associated with the training provided to paraeducators, as indicated by increases in the percentage of intervals with engagement with typical peers and the rate of initiations made to typical peers. Chung and Douglas (2015) also evaluated the effect of didactic instruction in combination with PF when training paraeducators supporting students with ASD who used speech-generating devices (SGD) to increase social interactions with typical peers. In this study, training for the three paraeducator participants consisted of 1-3 individual meetings that ranged from 35-50 minutes in length. Topics reviewed during meetings included the purpose of the study, an overview of social interaction facilitative strategies, and the review of a self-monitoring checklist. Following didactic training, observation sessions were conducted for paraeducators to implement the strategies reviewed. Following observation sessions, PF was provided on specific paraeducator target behaviors (i.e., prompting techniques). The results of the study demonstrated that, during the baseline condition, nearly no prompts to initiate interactions were provided by any of the three paraeducator participants. Following the intervention, the total number of paraeducator prompts for initiations increased to an average of eight. As in Kim et al. (2017) and Koegel et al. (2014),

paraeducator participants in this study judged the training procedures highly acceptable (Chung & Douglas, 2015). Lastly, Moudry Quilty (2007) also employed didactic instruction in combination with PF to train three paraeducators supporting students diagnosed with ASD in an elementary school setting to write and implement social stories. In this study, the paraeducator participants participated in two 1.5-hour training sessions. The content of the first training session involved details regarding the diagnosis of ASD, an introduction of social stories, and steps for writing social stories. The second training session consisted of information regarding implementation and revision of the social stories was provided. After the provision of didactic training, paraeducators began implementation phase in which PF was provided, as necessary, regarding details of the implementation as well as revisions to be made on the social stories developed by the paraeducators. The results of this study indicated that didactic training in combination with performance feedback served as an effective strategy to train paraprofessionals to write and implement social stories. In addition, the author indicated that as a result of implementation of social stories a decrease in the students' target maladaptive behaviors was observed.

Research has also explored and evaluated the effect of training packages consisting of didactic instruction in combination with BST (including performance feedback as a component of BST) when training paraeducators supporting students with ASD in school settings. For instance, Walker and Snell (2017) evaluated the effect of BST in combination with didactic training (e.g. one-hour workshops) when training three paraeducators to implement function-based interventions to address problem behavior for students with ASD. Specifically, paraeducators were trained to implement prevention strategies for the respective students (e.g., prompting strategies, activity presentation, activity schedules, establishing student preferences), teaching functionally equivalent replacement behaviors, as well as consequence strategies (e.g.,

reinforcement of replacement behavior, extinction of inappropriate behavior). The results of this study indicated an overall increase in the percentage of function-based strategies implemented by paraeducator participants from baseline to intervention during the training intervention. Training was terminated for paraeducators after at least 2 consecutive sessions at 100% implementation fidelity of function-based strategies (average of eight training sessions across participants during intervention). Moreover, Bolton and Mayer (2008) investigated the effectiveness of a brief training package (i.e., didactic instruction, modeling, general case instruction, and rehearsal with PF) that aimed at promoting the generalization of accurate implementation of discrete trial skills by three untrained paraeducators supporting students with ASD and/or other intellectual disabilities. Paraeducator training consisted of a 3-hour small group training related to discrete trial implementation (i.e., 45 minutes of didactic instruction, 45 minutes of demonstrations, with the remaining time for participant practice and PF). Results of this study indicated that following implementation of the training package, all participants increased their accuracy in delivering discrete trials from baseline to a high level of accuracy (98%-100%).

2.1 Statement of the Problem and Literature Review Research Questions

As noted, previous research in the topic of PF and paraeducator training has focused extensively on the evaluation of PF in combination with other strategies (e.g., didactic instruction), or as a component of a multi-component training package (e.g., BST) to improve or develop specific skills among paraeducators. However, despite the existing evidence of effectiveness of such training approaches at producing optimal results when attempting to increase implementation fidelity of paraeducator delivered interventions, implementation of these training approaches may

require increased amounts of time and resources, which may compromise the feasibility of training for paraeducators supporting students with ASD in school settings. Therefore, the need for the identification of training approaches for paraeducators that are, perhaps, less rigorous but more practical, time-efficient, and that produce equally effective outcomes is warranted. The purpose of this research review is to synthesize studies that have evaluated the effects of brief performance feedback (BPF) interventions when training paraeducators supporting students diagnosed with ASD and/or other intellectual disabilities in school settings. A BPF intervention, for the purposes of this literature review, is defined as the delivery of an intervention consisting of PF alone or in combination with only one antecedent strategy (e.g., instructions and feedback; modeling and feedback; rehearsal and feedback). Specifically, this research synthesis attempts to answer the following research questions: (1) what effect do BPF interventions have on the paraeducators' implementation of targeted practices/interventions for children diagnosed with ASD and/or other intellectual disabilities? (2) do BPF intervention results maintain after intervention termination? (3) what are the characteristics of PF in BPF interventions (e.g., temporal location, method of delivery, additional independent variables, length of feedback sessions)? and (4) what is the overall methodological quality of the reviewed studies?

2.2 Method

The literature review process included a systematic search the of available literature to identify relevant articles that evaluated the effect of a BPF intervention on the training of paraeducators supporting students diagnosed with ASD and/or other intellectual disabilities in school settings.

2.2.1 Search Strategy

The search for available articles consisted of a review of the PsychINFO and ERIC (via EBSCO) educational and social sciences databases. The search terms used included paraprofessionals (*n*=2,822); paraprofessionals and training (*n*=1,058); paraprofessionals and "special education" (*n*=190), paraprofessionals and performance feedback (*n*=20); paraprofessionals, training, and performance feedback (*n*=19); paraprofessionals, training, performance feedback, and autism (*n*=5); paraeducators (*n*=61); paraeducators and training (*n*=14); paraeducators and performance feedback (*n*=1), paraeducators, training, and autism (*n*=3); paraeducators, performance feedback, and autism (*n*=0); paraeducators, training, and performance feedback (*n*=0). Additional search terms included e-mail feedback (*n*=20); e-mail feedback and paraprofessionals (*n*=0); graphic feedback (*n*=20); graphic feedback and paraprofessionals (*n*=0); written feedback (n=1,450); written feedback and paraprofessionals (*n*=5); written feedback, paraprofessionals, and autism (*n*=0); technology-based feedback (*n*=2,020); technology-based feedback and paraprofessionals (*n*=1). In addition, the reference lists of the identified articles were reviewed in order to identify additional articles of relevance. The abstracts of the identified articles were reviewed in order to select relevant articles for the purposes of this review. Based on review of abstracts, 49 articles, full text, were further reviewed for inclusion criteria.

2.2.2 Inclusion Criteria

The authors included articles for the purposes of the present review only if they met the following criteria: (a) peer reviewed journal articles; (b) research design utilizing single subject research methodology; (c) studies that evaluated a BPF intervention – PF alone (to be included

they had to use feedback in any of the following forms: vocal verbal, written, graphic, e-mail, or through the use of technology) or in combination with only one additional, brief antecedent strategy (e.g., instructions and feedback, modeling and feedback, or rehearsal and feedback); (d) studies that included paraeducator staff who supported students diagnosed with ASD and/or other intellectual disabilities (paraprofessionals, classroom assistants, classroom aides, direct care staff also included); (e) studies conducted in public or private school classrooms (e.g., general or special education). It is important to note that, due to the limited research that evaluated brief feedback-based interventions to train paraeducators, studies in which paraeducators and other classroom team members (e.g., teachers) participated were included for the purposes of the present review, but only if data related to paraeducator performance could be disaggregated. Literature reviews, conceptual articles, non-peer reviewed articles, and/or dissertations were excluded for the purposes of the present review. A total of nine studies met criteria for inclusion for the present review after application of the inclusion criteria.

2.2.3 Coding Scheme

Based on indicators of quality for single case designs as suggested by Horner, Carr, Halle, McGee, Odom, and Wolery (2005), a code sheet was developed to evaluate the following features of the selected studies: (a) participant characteristics (e.g., age, gender, disability status, educational background); (b) setting (e.g., public elementary school special education classroom); (c) experimental design (e.g., multiple baseline design (MBD); alternating treatments design (ATD); etc.); (d) dependent measure(s); (e) characteristics of PF intervention (e.g., temporal location, method of delivery, additional strategy in intervention, length, etc.); (f) interobserver

agreement and social validity; (g) trainer's treatment fidelity; (h) visual analysis; (i) study outcomes; and (j) follow-up.

2.3 Results

Of the nine selected studies, two of the studies (22%) focused on increasing paraeducators' implementation fidelity when implementing discrete trial training for students diagnosed with ASD (Gilligan et al., 2007; Leblanc et al., 2005); two of the studies (22%) focused on increasing paraeducators' implementation fidelity when implementing pivotal response training procedures (PRT) to increase communicative behaviors and social interactions between students with ASD and typically developing peers (Feldman & Matos, 2012; Robinson, 2011); two other studies (22%) focused on increasing paraeducators' fidelity of implementation of behavior support plans ([BSP];Hagermoser Sanetti, Luiselli, & Handler, 2007) or behavior intervention plans ([BIP]; Madzharova, Sturmey, & Yoo, 2018); and the remaining three studies (33%) focused on increasing paraeducators' fidelity of implementation of skills or interventions such as mand training for students diagnosed with ASD (11%; Madzharova, Sturmey, & Jones, 2012); safety of lifting and transfer of students with intellectual disabilities (11%; Alavosious & Sulzer-Azaroff, 1986); as well as paraeducators' delivery of praise statements to students diagnosed with ASD (11%; Scheeler, Morano, & Lee, 2018). See Table 7 for a summary of information presented in the reviewed studies.

2.3.1 Participant Characteristics

The nine articles that met criteria for the present review included a total of 27 paraeducator participants. Across studies, a mean of three paraeducators participated in each study (range from 1-6 paraeducators). The level of detail provided on the participant characteristics varied across studies, from very detailed descriptions and data allowing replication (e.g., age, gender, experience as paraeducators, level of education, length of experience with target student, prior training, and criteria for selection in the study; Robinson, 2011) to only some detail (e.g., age range and length of employment; Alavosius & Sulzer-Azaroff, 1986). Of the 27 paraeducator participants in the reviewed studies, 20 (74%) were reported as females and one (14%) as a male. Alavosious and Sulzer-Azaroff (1986) did not report the gender of the six paraeducators participants in their study. Five of the nine reviewed studies (56%; Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Robinson, 2011; Scheeler et al., 2018) provided some detail regarding the age of the paraeducator participants in their respective studies. The age of paraeducator participants in the mentioned studies ranged from 18-60 years of age. The remaining four studies (44%; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018) did not provide any information regarding the paraeducator participants' age. The paraeducators' educational background was reported in only five studies (56%; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Robinson, 2011; Scheeler et al., 2018). It is important to note that Hagermoser Sanetti et al. (2007) reported educational level for only one of the two paraeducator participants in their study. Across these studies, the majority of paraeducator participants held a bachelor's degree (*n*=7), with the remaining paraeducators holding a high school diploma (*n*=5), having some college experience (*n*=2), and holding master's degree (*n*=1). No information regarding the educational background was provided for the

remaining 12 paraeducator participants across the four additional reviewed studies (i.e., Alavosious & Sulzer-Azaroff, 1986; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018). Eight of the studies included in this review (89%) reported the participants' years of experience as paraeducators (Alavosius & Sulzer-Azaroff,1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018). Prior experience supporting students with ASD and/or other intellectual disabilities ranged from no experience to 28 years of experience (i.e., *M*= 4.8 years of experience). It is important to note that Gilligan et al. (2007) only reported participants having experience supporting students with ASD; however, the years of experience was not reported. In addition, Hagermoser Sanetti and colleagues (2007) only reported the years of experience of only one of the two paraeducators in their study. The remaining study (Madzharova et al., 2012) did not report the years of experience of the paraeducator participants in their respective studies. Only four studies (44%) provided details regarding the prior training received by the paraeducator participants in their studies (Feldman & Matos, 2012; Gilligan et al., 2007; Scheeler et al., 2018; Robinson, 2011). Across these studies, prior training received by paraeducators included orientation trainings (*n*=2), school district in-service trainings (*n*=4), state professional development for paraeducator trainings (*n*=1), autism training (*n*=3), behavior modification trainings (*n*=3), and inclusion trainings (*n*=1). The remaining five studies (56%; Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018) did not report prior training received by their paraeducator participants. Additional details regarding the paraeducators reported in the reviewed studies included length of employment at the time of the studies took place (e.g., 0-1.5 years range across studies; Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005;

Madzharova et al., 2018) and time supporting their specific student (e.g., *M*= 7.8 months experience supporting their specific student across studies; range 1 month to 2 years range across studies; Feldman & Matos, 2012; Madzharova et al., 2018; Robinson, 2011).

Students with ASD and/or other intellectual disabilities also served as participants in the studies selected for the purposes of this review. Thirty children received intervention from paraeducators in the reviewed studies. The majority of the student participants had a diagnosis of ASD (*n*=28). The remaining two students had a diagnosis of an intellectual disability. Only one study (Alavosius & Sulzer-Azaroff, 1986) did not report the number of students involved in the study. Of the studies that reported student information, students ranged in age from 3-15 years of age. Mean age could not be calculated for all studies included in the present review as some studies (Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Scheeler et al., 2018) did not report the precise age of all student participants in their respective studies. Of the 30 student participants across the reviewed studies, the majority were male (*n*=19) and only two were female students. One study did not report the gender of their student participants (Scheeler et al., 2018). Lastly, one study reported the inclusion of typically developing children in their study (Feldman & Matos, 2012). However, no details were provided regarding the characteristics of the typically developing peers.

2.3.2 Settings

All of the studies selected for review (*n*=9) were conducted in school settings. Three studies (33%) were conducted in schools for children diagnosed with ASD and/or other intellectual disabilities (Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012); one study (11%) was conducted in a state residential school for students with intellectual disabilities (Alavosius &

Sulzer-Azaroff, 1986); and five studies (56%) took place in public school settings. Specifically, two of the studies were conducted in one (Madzharova et al., 2018), or multiple (i.e., one elementary and one middle school; Scheeler et al., 2018) special education classrooms (i.e., autism support), and three studies were conducted in general education classrooms (Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007; Robinson, 2011). Only one study (Madzharova et al., 2012) provided a detailed description of the physical characteristics of the setting(s) in which the study took place (i.e., size of room, physical arrangement of room(s)). The remaining eight studies (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) did not provide any information regarding the physical characteristics of the setting(s) in which studies took place.

2.3.3 Research Design Characteristics

All studies (*n*=9) used single case methodology, per inclusion criteria. In addition, all studies provided a specific description of the design used to evaluate the effects of the independent variable ([IV]; i.e., PF) on their selected dependent measures. However, only one study provided an explanation for the appropriateness of the type of design chosen for the purposes of their study (Madzharova et al., 2018). Eight studies (89%) employed different variations of the multiple baseline design (MBD; Baer, Wolf, & Risley, 1968). For instance, six of the reviewed studies employed a concurrent MBD across participants (Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Robinson, 2011; Scheeler et al., 2016). Alavosius and Sulzer-Azaroff (2006) employed another variation of the MBD (i.e., MBD across participants and settings). One study (Hagermoser Sanetti et al., 2007) employed a multiple treatment reversal A-B-BC-B-BC design

for the purposes of their investigation. It is important to note that two of the reviewed studies employed non-experimental designs (i.e., non-concurrent MBD across participants, Madzharova et al., 2018; AB design, Madzharova et al., 2012). In the case of Madzharova and colleagues (2018) the use of a non-concurrent MBD across participants in their study does not or cannot provide a convincing demonstration of experimental control due to its failure to concurrently evaluate dependent variable (DV) levels in baseline conditions (Ledford & Gast, 2018), thus weakening the internal validity of the study. Similarly, Madzharova and colleagues (2012) employed a non-experimental design (i.e., AB design) for the purposes of their study. By the use of this design, no intra-participant replications of experimental effect are possible; thus, any changes in target behaviors are only presumed to be a function of implementation of the IV (Ledford & Gast, 2018). Therefore, no experimental control can be demonstrated by the use of this design. In addition, all studies in this review (*n*=9) included a baseline condition and at least one treatment condition. Across all of the reviewed studies, a pattern of responding was established by repeated measures of the selected DV(s) during the baseline condition and prior implementation of the IV (i.e., a minimum of three baseline data points in baseline). For studies that employed variations of the MBD (e.g., across participants or settings; *n*=7), only two studies reported some information regarding how researchers determined the criteria for introduction of the intervention for paraeducator participants (Leblanc et al., 2005; Scheeler et al., 2018). For instance, Leblanc and colleagues (2005) indicated that for participants one and two, introduction of intervention was determined randomly, and began with participant three when she was added subsequently to the study. Similarly, Scheeler et al. (2018) reported that paraeducators' target behavior (i.e., contingent praise) was variable during baseline with no trend emerging thus showing a stable baseline. Therefore, paraeducators were introduced into the intervention phase after five, seven, nine, and

eleven baseline sessions, respectively. However, no specific paraeducator performance criterion was indicated. The remaining studies that employed variations of the MBD (*n*=5; Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Madzharova et al., 2018; Robinson, 2011) did not provide any information regarding specific criteria for inclusion of paraeducator participants into their respective intervention phases. Last, the two remaining studies that employed designs other than variations of the MBD (i.e., multiple treatment reversal A-B-BC-B-BC design, Hagermoser Sanetti et al., 2007; AB design, Madzharova et al., 2012) did not provide any information as to how experimental phases, in their respective studies, were introduced or discontinued.

2.3.4 Dependent Variables and Measurement

2.3.4.1 Paraeducator dependent variables.

Eight of the nine studies included in this review (89%) attempted to increase or improve implementation fidelity of paraeducator delivered interventions or strategies for students with ASD and/or other intellectual disabilities (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011). Only one study (Scheeler et al., 2018) selected two paraeducator measures other than implementation fidelity. Of the nine studies selected for the purposes of this review, six (67%) employed direct, live observation as the primary method of measurement of their selected DV (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018). The three remaining studies (33%; Feldman and Matos, 2012; Robinson, 2011; Scheeler et al., 2018) employed video of paraeducators' performance, across experimental conditions, for the

purposes of data collection and analysis (e.g., video of 10-minute probes across baseline, intervention, generalization, and maintenance; Feldman & Matos, 2012; Robinson, 2011). It is important to note that across these three studies (Feldman & Matos, 2012; Robinson et al., 2011; Scheeler et al., 2018), all data collection and analysis occurred remotely. The studies that evaluated paraeducator fidelity of implementation (*n*=8, 87%) measured their respective DV(s) in terms of treatment adherence (Hagermoser Sanetti & Kratochwill, 2009). These measures included: (a) the percentage of transfers safely performed (Alavosius and Sulzer-Azaroff, 1986); (b) percentage of discrete trial instruction steps correctly implemented (Gilligan et all., 2007; Leblanc et al., 2005); (c) percentage of BSP or BIP components or steps correctly performed (Hagermoser Sanetti et al., 2007; Madzharova et al., 2018); (d) percentage of peer to peer mand training steps correctly performed (Madzharova et al., 2012); and (e) the percentage correct on fidelity of implementation of PRT procedures (Feldman & Matos, 2012; Robinson, 2011). Conversely, Scheeler and colleagues (2018) measured their selected DV(s) in terms of the percentage of praise statements delivered by paraeducators as well as the rate of praise statements by paraeducators per minute. In addition, in the studies that assessed paraeducator implementation fidelity, checklists created by the experimenters, with specific definitions of target behaviors from experimenter-conducted task analyses of target skills (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzarhova et al., 2018), or from previously conducted task analyses (Feldman & Matos, 2012; Robinson, 2011) were used to collect paraeducator implementation fidelity data. For example, in Gilligan et al. (2007) the authors task analyzed a discrete trial into five skill categories (i.e., delivering the discriminative stimulus (SD), delivering reinforcement, response correction, recording data, and inter-trial interval) and ten component behaviors. The experimenter recorded the participants' implementation of discrete

trial instruction, using a checklist that specified each skill and component behaviors. These data were collected during the first ten trials of the session. Leblanc et al. (2005) measured the correct implementation of discrete trial instruction through the completion of a checklist that included ten instructional skills to be performed during the session (i.e., arrange environment, direct student to session, orient student, secure student's attention, present discriminative stimulus, deliver level of prompting designated in learning program, reinforce student's accurate response, correct student's inaccurate response (as warranted), pause 3-5 seconds between trial presentations, and record data following each completed trial). Similarly, Hagermoser Sanetti and colleagues (2007) also task analyzed components of a student's BSP and developed a 27 BSP-component treatment integrity observation datasheet (e.g., checklist) for data recording purposes (e.g., "use behavior-specific directions when making a request of Mike"). These data were collected during one-hour observation sessions approximately every six days throughout the study. Also, Madzharova et al. (2018) developed a 16-item checklist that included all behaviors a paraeducator and the classroom team (i.e., teacher and therapist) needed to display when implementing a student's BIP (e.g., when working with Eric use a neutral tone of voice; if Eric engages in biting or any other disruption immediately discontinue free time and begin at step 1). Robinson (2011), on the other hand, scored paraeducator implementation of PRT procedures using a 10-minute fidelity of implementation measure adapted from Koegel and Koegel (2006). An identical data collection tool was employed by Feldman and Matos (2012). It is important to note that trial by trial seemed the preferred method for collection of data across the reviewed studies (*n*=9; Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007., Gilligan et al., 2007., Leblanc et al., 2005., Madzharova et al., 2012., Madzharova et al., 2018; Robinson et al., 2018., Scheeler et al., 2018). Measurement, with respect to implementation fidelity, consisted of experimenters

recording, across experimental phases, whether paraeducators did or did not display the skills as defined on their specific checklists (e.g., +/- for correct or incorrect behaviors). Implementation fidelity was calculated, across studies, by dividing the total number of correct responses by the total number of correct responses plus incorrect responses and then multiplied by 100 (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007., Gilligan et al., 2007., Leblanc et al., 2005., Madzharova et al., 2012., Madzharova et al., 2018; Robinson et al., 2018). Similarly, Scheeler et al. (2018) measured the percentage of paraeducator delivered contingent specific praise statements by dividing total number of contingent praise statements (specific and non-specific), then multiplying the quotient by 100. Last, the authors also reported the rate of praise statements delivered by paraeducators per minute by dividing the number of specific praise statements by session length (i.e., 10-20 minutes; Scheeler et al., 2018).

2.3.4.2 Student dependent variables.

. Additional DVs related to student outcomes were assessed by some of the studies included in this review. Of the nine reviewed studies, four studies (44%) attempted to assess specific student measures. For instance, to assess whether students' social communicative behaviors had improved as a result of paraeducator training, Robinson (2011) measured the number of peer directed verbalizations, the number of verbal requests, the number of word combinations, and the number of verbal reciprocal interactions with peers. Similarly, Feldman and Matos (2012) assessed the effect of paraeducator training on the social engagement of target students with ASD with their typically developing peers. Specifically, the authors measured percent of intervals (i.e., 30 second intervals) target students with ASD were engaged in reciprocal social behavior with their typical peers. Madzharova et al. (2012) assessed the frequency of independent and prompted peer to peer mands of target students with ASD. Finally, Hagermoser Sanetti et al. (2007), assessed the effect

of training a paraeducator, member of a classroom team, to implement a BSP for a student with ASD by measuring the target student's average percentage of activities with appropriate behavior. The remaining of the studies (n=5; Alavosius & Sulzer-Azaroff, 1986; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2018; Scheeler et al., 2018) did not report any student measures.

2.3.4.3 Inter-observer agreement (IOA).

All of the reviewed studies (*n*=9) reported measures of reliability and/or IOA (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018). In all nine studies, a second and/or third trained observer (e.g., Madzharova et al., 2018, Robinson, 2011) conducted, jointly or independently, observations to assess measurement of the dependent variable. Two studies (22%; Robinson, 2011; Scheeler et al., 2018) reported characteristics of second observers (e.g., two undergraduate research assistants, Robinson, 2011; one graduate research assistant, Scheeler et al., 2018). In addition, five studies (56%) provided specific definitions of what constituted an agreement or a disagreement (e.g., agreement defined as both observers scoring a task component as "safe", "unsafe", or "not applicable", Alavosius & Sulzer-Azaroff, 1986; an agreement was scored if each observer recorded correct/incorrect performance on the discrete trial, Gilligan et al., 2007; Leblanc et al., 2005; both observers marked the same score for the same task analysis step, Madzharova et al., 2012; Madzharova et al., 2018). Reports of IOA, across all reviewed studies (*n*=9), were obtained by dividing the number of agreements by the sum of agreements and disagreements and then multiplying by 100. Across all studies, IOA data were collected for a range of 17%-43% of

observation sessions, with a total mean IOA across studies of 94.1% (range 88.9%-98% agreement).

2.3.5 Independent Variable

A BPF intervention for the purposes of this review was defined as the delivery of an intervention consisting of PF alone (e.g. vocal/verbal, written, graphic, technology-based) or in combination with only one antecedent strategy (e.g., BST component plus PF). All studies reviewed (*n*=9, Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) evaluated the effect of PF-based interventions when training paraeducators to deliver targeted interventions or strategies for students with ASD and/or other intellectual disabilities in school settings.

2.3.5.1 Performance feedback characteristics.

The characteristics of PF interventions across the reviewed studies (*n*=9) varied in terms of temporal location of feedback (i.e., during session; post-session), method of feedback delivery (vocal verbal, graphic, written, technology-based; scripted/non-scripted), additional strategy used in the independent variable (IV), and the length of feedback sessions.

2.3.5.1.1 Temporal location of feedback.

In terms of the temporal location of PF, two of the nine studies reviewed (22%) delivered in vivo or in-session PF throughout the duration of established observation sessions (Feldman & Matos, 2012; Scheeler et al., 2012). In these two studies, the delivery of feedback occurred

immediately after a paraeducator's observed target behavior (Scheeler et al., 2018) or after a specific time interval based on paraeducator performance (i.e., average of two minutes for correct performance or every 5-30 seconds for incorrect performance; Feldman & Matos, 2012). In the remaining seven studies (78%, Alavosius & Sulzer-Azaroff, 1986; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011) PF was delivered following the observation session (i.e., post-session).

2.3.5.1.2 Method of delivery.

With respect to the method of delivery of PF, five studies (56%, Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018;) employed a traditional vocal verbal method when delivering PF to the paraeducators. Across these studies (Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018) PF consisted of the experimenter or trainer employing praise and approval for correct implementation (e.g., "very good, you made sure the student was looking at you every time before starting a trial", Leblanc et al., 2005; "you did a great job using a neutral tone of voice", Madzharova et al., 2018) as well as corrective feedback (e.g., "next time make sure to remind Eric to keep his hands down", Madzharova et al., 2018). Two other studies (22%) employed a combination of methods of delivery; vocal verbal feedback and written feedback (Alavosius & Sulzer-Azaroff, 1986) and vocal verbal feedback and graphical feedback (Hagermoser Sanetti et al., 2007). For example, verbal plus written feedback in Alavosius and Sulzer-Azaroff's (1986) consisted of the experimenters providing the paraeducartors with specific vocal verbal praise and/or corrective feedback specific to their performance. Written feedback consisted of the delivery of a standard written summary with specific comments related to their performance (e.g., "your transfers continue to be very safe") and recommendations for

improvement. This combination of methods was delivered to participants approximately once every week. Similarly, graphical feedback plus vocal verbal feedback (Hagermoser Sanetti et al., 2007) consisted of a) presentation of a graph of the percentage of BSP components implemented as written, b) corrective feedback for incorrectly implemented steps, and c) answer questions. In this study, this combination of methods was employed only when participants dropped implementation fidelity below 80% for three consecutive days after provision of vocal verbal PF only. Another of the reviewed studies (11%) employed video feedback, which consisted of a) the trainer and paraeducator reviewing the videotaped session, b) the experimenter providing specific verbal praise related to correct implementation and corrective feedback, c) viewing correct and incorrect use of techniques, and d) questions and answers (Robinson, 2011). The remaining study (11%, Scheeler et al., 2018) employed vocal verbal feedback through the use of technology (i.e., bug-in-ear [BIE] - a one-way wireless transmitter via an ear bud connected to a receiver). This was done in order to increase the teachers' ability to deliver feedback to paraeducators during live activities in an unobtrusive manner. Specifically, feedback consisted of teacher delivery of short, concise praise or corrective statements (e.g., "good use of specific praise" or "be more specific"), through the BIE, immediately following a paraeducator's observed behavior (Scheeler et al., 2018). Last, no study selected for the purposes of this review reported employing scripted feedback for the purposes of maintaining consistency of feedback delivery across paraeducator participants. All studies included in this review used non-scripted PF.

2.3.5.1.3 Additional strategy in independent variable.

With respect to additional strategy in the IV, two of the nine studies selected for the purposes of this review (22%) employed performance feedback alone (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007). Two other studies (22%) used skill rehearsal as

an additional independent variable (Gilligan et al., 2007; Scheeler et al., 2018). It is important to note that in Scheeler et al. (2018) skill rehearsal occurred once prior the observation session. However, Gilligan et al. (2007) employed skill rehearsal following verbal performance feedback and only for incorrectly performed steps. Three studies (33%) used brief modeling strategies such as in-vivo modeling (Madzharova et al., 2018; Robinson, 2011) and video modeling (Madzharova et al., 2012) as additional independent variables for the purposes of their respective studies. Madzharova and colleagues (2012) and Robinson (2011) implemented modeling strategies prior to implementation of observation sessions. It is important to note that Robinson et al. (2011) provided modeling for only three consecutive sessions following the last baseline session. Madzharova et al. (2018), conversely, provided in-vivo modeling of procedures following the paraeducator's first performance feedback session. In addition, in Madzharova et al. (2018) and Robinson (2011) modeling of procedures occurred with the actual target students. Lastly, the two remaining studies (22%, Feldman & Matos, 2012; Leblanc et al., 2005) employed reviews of checklists or protocols as an additional training strategy. Checklist or protocol reviews occurred, in these two studies, prior the first performance feedback session only (Feldman & Matos, 2012; Leblanc et al., 2005).

2.3.5.1.4 Length of feedback sessions.

Eight of the nine studies reviewed (89%) provided information regarding the length of feedback sessions (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Robinson, 2011; Scheeler et al., 2018). Across these studies (*n*=8), performance feedback session duration ranged from 5-20 minutes. It is important to note that Feldman and Matos (2012) and Scheeler and colleagues (2018) reported as feedback session duration the duration of observation sessions

because feedback was provided in-vivo throughout observation sessions (i.e., 10-20 minutes). Only one study (11%, Madzharova et al., 2018) did not provide specific information regarding the duration of performance feedback sessions.

2.3.5.2 Intervention treatment fidelity.

Four of the nine reviewed studies (44%) provided measures of treatment fidelity on the implementation of PF interventions (Hagermoser Sanetti et al., 2007; Madzharova et al., 2012; Madzharova et al., 2018; Scheeler et al., 2018). Of these four studies, three studies utilized a trained, independent observer (e.g., research assistant, Madzharova et al., 2012; Madzharova et al., 2018; Scheeler et al., 2018) for the purposes of collection of intervention fidelity data. Hagermoser Sanetti and colleagues (2007) completed procedural fidelity checklist via trainer's self-report. Treatment fidelity data were collected for a range of 22%-73% of intervention sessions (*M*=40%). Mean treatment fidelity across studies (Hagermoser Sanetti et al., 2007; Madzharova et al., 2012; Madzharova et al., 2018; Scheeler et al., 2018) was 98.5% (range 94%-100%). The remaining five studies (56%, Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Robinson, 2011) did not provide measures of intervention implementation fidelity.

2.3.6 Study Outcomes

As suggested by Rispoli and colleagues (2011), study outcomes were classified as positive, negative, or mixed based on the data provided by the experimenters. Positive outcomes referred to studies in which the DV(s) improved for all paraeducators as a result of brief feedback-based interventions. Mixed outcomes referred to studies in which only some paraeducators made

improvements and other did not or in which some of the targeted skills interventions did not reach criterion for correct implementation. Negative outcomes referred to studies in which no effect was observed following intervention.

2.3.6.1 Paraeducator outcomes.

All nine studies included in this review (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) reported positive outcomes in that, following implementation of the intervention (i.e., BPF), paraeducators implementation of their respective target skills improved from baseline to intervention. Two studies (22%, Alavosious & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007) reported moderate changes in level, from baseline to intervention, after implementation of the first intervention session. However, subsequent, more drastic improvements were observed as these studies progressed (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007). The remaining seven studies (78%, Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) reported immediate, drastic changes in level, from baseline to intervention, following the first intervention session. No study reported mixed or negative outcomes.

2.3.6.2 Student outcomes.

Only four studies (44%, Feldman & Matos, 2012; Hagermoser Sanetti et al., 2007; Madzharova et al., 2012; Robinson et al., 2011) measured and reported data on the effect of paraeducator training on the targeted behaviors for the students with ASD and/or other disabilities. Of those four studies, all reported positive results on their respective student DVs. The remining

five studies (56%; Alavosius & Sulzer-Azaroff, 1986; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2018; Scheeler et al., 2018) did not measure or report information regarding student outcomes.

2.3.7 Follow-Up

Five of the nine studies selected for this review (56%, Alavosious & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Robinson, 2011) provided details regarding paraeducators' performance during follow-up sessions. Across these studies (*n*=5, 56%), the number of follow-up sessions ranged from 1-10 sessions (*M*=3.1 follow-up sessions). In addition, across these studies (*n*=5), follow-up sessions were conducted within a range of one week of training termination (Alavosious & Sulzer-Azaroff, 1986) to seven months of training termination (Alavosius & Sulzer Azaroff, 1986). Paraeducator performance ranged from 75%-100% correct implementation across follow-up sessions. It is important to note that Gilligan et al. (2007) provided follow-up data for only one of the three paraeducators in their study due to the other two participants no longer working at the school. Madzharova and colleagues (2018) provided follow-up information for members of the classroom team in their study except the paraeducator participant due to time constrains. The remaining two studies (22%, Hagermoser Sanetti et al., 2007; Scheeler et al., 2018) did not provide information regarding paraeducator performance during follow-up sessions.

2.3.8 Social Validity

Five of the nine reviewed studies reported the assessment of social validity across paraeducators (Alavosious & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Leblanc et al., 2005; Robinson, 2011; Scheeler et al., 2018). Of these five studies, three studies employed experimenter-developed questionnaires regarding the acceptability of the training procedures (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Scheeler et al., 2018), one study employed a rating scale (e.g., Acceptability Rating Scale (Davis, Ramana, & Capponi, 1989); Leblanc et al., 2005), and one other study used both to measure social validity (Robinson, 2011). General positive results as well as satisfaction and high acceptability of intervention procedures were reported by four sets of authors (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Robinson, 2011; Scheeler et al., 2018). Leblanc and colleagues did not provide any information regarding the results of the social validity assessment in their study. The remaining four of the studies reviewed (44%, Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Madzharova et al., 2012; Madzharova et al., 2018) did not provide any information regarding the assessment of social validity.

2.3.9 Methodological Quality of Studies

All studies included in this review employed single case designs for the purposes of their research. However, two of the nine studies reviewed (22%) employed non-experimental single subject designs (e.g., AB design, Madzharova et al., 2012; non-concurrent MBD across participants; Madzharova et al., 2018) which compromises the studies' internal validity. Of important consideration, in the majority of the studies reviewed (78%, Alavosious & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2005; Hagermoser Sanetti et al., 2007;

Leblanc et al., 2005; Robinson, 2011; Scheeler et al., 2018), at least three demonstrations of the effect of the IV (i.e., BPF) on study-specific DV(s) were produced, suggesting experimental control or functional relations between dependent and IV(s), thus increasing the internal validity of each study. It is important to note that, the use of a non-concurrent MBD (Harvey, May, & Kennedy, 2004) across participants by Madzharova et al. (2018) did not allow for concurrent measurement of DV(s) during baseline conditions thus, not providing as convincing evidence of experimental control or functional relation (Ledford & Gast, 2018). However, the effect of the intervention in this study was observed at different points in the study and across several participants, which may suggest that the change in behavior in participants may be related to intervention implementation (Watson & Workman, 1981).

Moreover, all reviewed studies (*n*=9, Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) documented their findings using a traditional visual analysis that graphically showed the manipulation of the IV(s) and the effect on the DV(s), over time, as suggested by established indicators of methodological quality (Horner et al., 2005; Kratochwill, Hitchcock, Horner, Levin, Odom, Rindskopf, and Shadish, 2013). This allowed the comparison of paraeducator responding across experimental phases, as well as the analysis of level, tend, and variability of paraeducator performance within and across study phases. Overall, these aspects increased the overall quality of those studies. Similarly, the studies included in this review (*n*=9), all provided measures of their respective DV(s) over baseline and intervention conditions, repeatedly and over time. Sufficient data points to determine stability during baseline conditions were provided across the reviewed studies (*n*=9). This aspect strengthens the internal validity of each study.

Eight sets of authors (89%, Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011) focused on increasing paraeducator treatment fidelity of targeted skills or interventions. The authors demonstrated concern for this aspect by developing or adapting detailed task analyses of target skills selected for evaluation and developing checklists with specific definitions of target behaviors for data collection purposes. Similarly, four sets of authors (44%) demonstrated concern for the implementation integrity of intervention procedures (Hagermoser Sanetti et al., 2007; Madzharova et al., 2012; Madzharova et al., 2018; Scheeler et al., 2018). The authors did so by developing task analyses with specific definitions of behaviors involved in intervention delivery. Measures of treatment fidelity of intervention implementation were not reported by the remaining five studies, compromising the overall methodological quality of such studies (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Robinson, 2011). Additionally, all reviewed studies (*n*=9) reported IOA of dependent measures in order to increase the believability of the data collected. Specifically, across the nine reviewed studies, levels of IOA reported met or surpassed the minimum standard suggested by single subject research quality indicators (i.e., IOA = 80%; Horner et al., 2005).

With respect to the measurement of each of the reviewed studies' DV(s), all studies (*n*=9) provided clear and detailed descriptions as to the procedures for measurement study-specific DV(s) across the experimental phases of each study. This aspect increases the replicability of each study and the overall methodological quality of each study. Similarly, all studies (*n*=9) included in the present review provided detailed descriptions of the additional components included in the IV in each study (e.g., skill rehearsal, Gilligan et al., 2007; instructions/review, Leblanc et al.,

2005; video modeling, Madzharova et al., 2012; in vivo modeling, Madzharova 2018; Robinson, 2011) as well as the specific procedures for implementation of those strategies during intervention phases of each of the studies. This aspect also enhances the replicability of those studies. However, specific details regarding the delivery of PF were not clearly described or omitted by the majority of the studies (e.g., scripted vs. non-scripted feedback, dosage of PF; Alavosius & Sulzer-Azaroff, 1986; Gilligan et al., 2007; Hagermoser et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018), thus compromising the replicability and overall internal validity of each study. Lastly, across the studies reviewed (*n*=9), description of participants and settings varied greatly. Only four studies (44%) described paraeducator characteristics with replicable precision (e.g., age, gender, educational background, years of experience, training level; Feldman & Matos, 2012; Gilligan et al., 2007; Robinson, 2011; Scheeler et al., 2018). The remaining 56% of studies (*n*=5) did not provide enough details regarding paraeducator participants which compromises the replicability of those studies. Similarly, only 11% of studies (*n*=1, Madzharova et al., 2012) provided enough detail regarding the setting to allow for replication. The remaining eight studies only provided some general detail of the experimental setting (e.g., school for students with ASD and/or other intellectual disabilities; Gilligan et al., 2007; Leblanc et al., 2005; autism support classroom, Scheeler et al., 2008), thus compromising the replicability of those studies and their overall methodological quality.

2.4 Discussion

Despite the effectiveness of multicomponent interventions (e.g., BST; didactic plus BST; Mathews & Hagopian, 2014; Kim et al., 2017) at achieving optimal outcomes when training

paraeducators, these trainings can be resource and time-intensive for educational settings, thus compromising the feasibility of paraeducator training (Nigro-Bruzzi & Sturmey, 2010). The purpose of this review was to synthesize the existing literature regarding the effect of BPF interventions when training paraeducators supporting students with ASD and/or other intellectual disabilities in school settings to implement targeted interventions. A BPF intervention, for the purposes of this review, was defined as the delivery of an intervention consisting of PF alone or in combination with only one antecedent strategy (e.g., BST component). The focus on paraeducators supporting students diagnosed with ASD for the purposes of the present literature review was due to the very specific, specialized knowledge and skill sets required in order to support and deliver instruction to students diagnosed with ASD effectively in schools (Layden, Hendricks, Inge, Sima, Erickson, Avellone, & Wehman, 2018). In addition, the present review provides an analysis of the methodological rigor of studies that experimentally evaluated BPF interventions when training paraeducators. Specifically, this review attempted to answer the following research questions: (1) what effect did BPF interventions have on the paraeducators' implementation of targeted practices/interventions for children diagnosed with ASD and/or other intellectual disabilities in the reviewed studies? (2) did BPF interventions results maintained after intervention termination in the reviewed studies? (3) what are the characteristics of PF in BPF interventions (e.g., temporal location, method of delivery, additional independent variables, length of feedback sessions)? and (4) what is the overall methodological quality of the reviewed studies? It is important to note that two of the reviewed studies (Hagermoser Sanetti et al., 2007; Madzharova et al., 2018) evaluated the performance of classroom teams that included paraeducators and other professional team members (e.g., special education teachers, general education teachers, therapists). However, only

the results of paraeducator participants in those studies were reported for the purposes of this review.

Across the nine studies evaluated in this review, the implementation of BPF interventions appeared effective at increasing paraeducator implementation fidelity of targeted interventions for students with ASD and/or other intellectual disabilities (Alavosius & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Hagermoser Sanetti et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011) or improve paraeducator delivery of a specific consequence strategy (e.g., praise, Scheeler et al., 2018). Additionally, outcomes of studies evaluated in this review (Feldman & Matos, 2012; Gilligan et al., 2018; Leblanc et al., 2018; Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; Scheeler et al., 2018) not only suggested evidence of the overall effectiveness of BPF interventions, but also of the potential potent effects of these interventions demonstrated by the immediate and drastic level changes observed, from baseline to intervention, after only one implementation of the BPF intervention. Only two of the reviewed studies (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007) demonstrated more gradual level changes, however, consistent improvements in paraeducator performance were observed as those studies progressed. The use of non-experimental designs by two sets of authors (i.e., AB design, Madzharova et al., 2012; non-concurrent MBD, Madzharova et al., 2018) may weaken the overall effectiveness of the research base regarding the effect of BPF on paraeducators' instructional behavior, thus, the results of these two studies warrant careful interpretation. Overall, this literature base may be described as limited due to the number of available experimental studies, however, the results of the reviewed studies suggest that the implementation of a BPF intervention, when training paraeducators supporting

students with ASD and/or other intellectual disabilities, appear as a potentially effective and practical alternative in school settings (Gilligan et al., 2007; Leblanc et al., 2005; Robinson, 2011).

Additionally, this research review sought to determine whether the implementation of BPF interventions would produce durable effects on paraeducator implementation of targeted interventions for students with ASD and/or other intellectual disabilities after training termination. Five of the nine studies reviewed provided data regarding the performance of paraeducators after BPF intervention termination (Alavosious & Sulzer-Azaroff, 1986; Feldman & Matos, 2012; Gilligan et al., 2007; Leblanc et al., 2005; Madzharova et al., 2012; Robinson, 2011). Reported results across these studies suggested that paraeducators maintained high levels of implementation of their specific targeted practices past training termination (i.e., 75%-100%). It is important to note that only one paraeducator across these studies displayed performance lower than 90% during follow-up sessions (Robinson, 2011). These data may also provide further evidentiary support of the effectiveness and powerful nature of BPF interventions when training paraeducators in schools. However, overall, insufficient evidence is provided regarding durability of training effects due to that (a) Only 56% of the reviewed studies reported skill maintenance across paraeducator participants; (b) some of the studies did not provide repeated measures of skill maintenance at different points in time past termination of intervention (e.g., only one follow-up session; Feldman & Matos, 2012; Gilligan et al., 2007; Robinson, 2011); and (c) follow-up data being collected for only some paraeducators (e.g., Gilligan et al., 2007). Although promising, the data provided, across the reviewed studies, regarding paraeducators' skill maintenance warrants careful interpretation and the determination whether the implementation of a BPF intervention produces durable effects across paraeducartor participants remains unclear.

An important consideration in this synthesis is regarding the characteristics of feedback interventions used in the studies reviewed. With respect to the method of delivery, as the extant literature has suggested, PF can be delivered via multiple methods (e.g., verbal, graphical, written, technology-based, etc.; Barton & Wolery, 2007; Hattie & Timperley, 2007; Luck et al, 2018). Across the nine studies reviewed, PF was mostly vocal verbal and specific to paraeducator performance. Interestingly, two of the reviewed studies (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al.,2007) employed additional methods of feedback delivery, supplemental to vocal verbal feedback (e.g., written and graphical, respectively), in order to further improve paraeducator performance and obtain optimal levels of implementation fidelity. The findings of these two studies may suggest that the implementation of multiple methods of PF delivery may be necessary to obtain best implementation results across paraeducators. However, evaluating the degree of effectiveness of different methods of PF delivery is an area that warrants further investigation (Alvero et al., 2001; Reid & Parsons, 2006).

In addition, in the present review, no study reported the use of PF delivery intervention scripts in attempts to foster consistency of feedback delivery across paraeducator participants. Without a consistent and/or uniform feedback delivery system or generating a specific methodological standard to guide assessment of PF as an IV, it is possible that behavior change differences observed across participants, in the studies reviewed, may be due to differences in quality, dosage, and/or frequency of feedback delivery serving a reinforcing or punishing function (Alvero et al., 2001), thus possibly impacting the overall measurement and assessment of implementation integrity (Collier-Meek, Fallon, & Gould, 2018). Moreover, the variable nature of PF delivery, across the reviewed studies, may compromise, not only the replicability of studies that attempt to evaluate the effect of brief or abbreviated feedback-based interventions, but also

the effective implementation of feedback-based interventions in educational or human service settings.

Last, the delivery of PF in combination with only one additional strategy (e.g., instructions/review, Feldman & Matos, 2012; Leblanc et al., 2005; modeling/video modeling, Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011; rehearsal, Gilligan et al., 2007; Scheeler et al., 2018) seemed sufficient to achieve high levels of implementation fidelity across paraeducators in the reviewed studies. Similar findings, from the teacher training literature, have provided support to this notion, in that, the combination of a single strategy (e.g., modeling) and PF appeared as the necessary and sufficient components to train teachers to implement targeted practices (e.g., functional analysis, Ward-Horner & Sturmey, 2012).

2.4.1 Efficiency of Brief Performance Feedback Intervention

An aspect of high of importance for the purposes of this review regards to the potential efficiency of BPF interventions when training paraeducators to implement targeted interventions for students with ASD and/or other intellectual disabilities. According to Ledford and Gast (2018), first, to be efficient an intervention or a strategy must be effective. Second, an intervention must be superior to another strategy on at least one important dimension (e.g., rapidity, maintenance and generalization, acquisition of untrained relations). In addition, the most commonly-measured dimension of efficiency is the rapidity of learning (Ledford & Gast, 2018). As earlier discussed, all studies included in this review reported results that demonstrated overall effectiveness of brief performance feedback interventions (feedback alone or in combination with a single strategy) at increasing paraeducator implementation fidelity, as well as rapid level changes, from baseline to first delivery of feedback interventions, which may be indicative of potent intervention effects. In

addition, in eight of the nine studies reviewed, paraeducators reached mastery criteria or training termination within an average of 4.6 intervention sessions (range 3-7 intervention sessions). Only one study (Alavosius & Sulzer-Azaroff, 1986) reported longer intervention phases. Moreover, the addition of a single strategy, as an intervention component, did not seem to greatly impact the duration of performance feedback sessions (i.e., range of 5-20 minutes across studies). Considering the overall effectiveness of BPF interventions and the rapid learning likely to result from their implementation, the outcomes of the studies reviewed may suggest these types of interventions as equally effective and perhaps, equally or more practical and efficient methods for training paraeducators than other more complex, established multicomponent training methods (e.g., BST; Ward-Horner & Sturmey, 2012). Additionally, the minimal time commitment that would be needed by special educators to implementing interventions of this type could greatly increase the feasibility of paraeducator training in actual special education settings.

2.4.2 Measurement

Despite the potential, overall effectiveness and efficiency of BPF interventions, as suggested by the outcomes of the reviewed studies, when training paraeducators supporting students with ASD and/or other intellectual disabilities in school settings, the majority of studies failed to assess aspects that could compromise the overall methodological quality of the research base, and thus the overall effectiveness of BPF interventions. For instance, the majority of reviewed studies measured dimensions of treatment fidelity related to treatment adherence (e.g., percentage of steps correctly implemented of a given intervention; Hagermoser Sanetti & Kratochwill, 2009). This finding may indicate that paraeducator participants, across the reviewed studies, may have solely received training and PF related to the extent of steps implemented

correctly rather than other important treatment integrity dimensions such as quality (i.e., how well intervention steps are delivered) or quantity (i.e., the duration that the intervention is received by the participant or how much of the intervention is received by the participant; Hagermoser Sanetti & Kratochwill, 2009). Therefore, the nature of PF delivered to paraeducators across the reviewed studies may not reflect, comprehensively, other important details of implementation (Collier-Meek et al., 2018). In addition, none of the studies reviewed provided information regarding how quickly paraeducators implemented steps of their selected target interventions or how long implementation took place, which fails to provide important additional details regarding the potential efficiency of brief, feedback-based strategies for training paraeducators. Last, studies in this review did not provide details regarding the ease or difficulty of critical component skills in targeted interventions. Considering response effort as a variable that could impact implementation integrity outcomes (Gresham, 1989; Hagermoser Sanetti & Kratochwill, 2009), without an assessment of response effort of specific component skills, overall paraeducator implementation fidelity may be compromised due to some component skills being harder, or that would require more time or effort to implement than other component skills in targeted interventions (Gresham, 1989).

2.4.3 Methodological Quality

In discussing the methodological quality of the studies included in this synthesis, it is important to highlight that the majority of studies in the present review met, to some extent, most of quality indicators in single subject research suggested by Horner et al. (2005) and Kratochwill and colleagues (2013), thus strengthening the overall quality of the research base. It is also important to mention that, despite the positive outcomes reported by all of the authors, attention must also be given to some of the methodological weaknesses identified across each of the

reviewed studies. For instance, all studies, to varying degrees, lack information, or did not include components, that would enhance the internal validity and external validity of each study and increase its replicability (e.g., participant description, setting characteristic, measurement, treatment fidelity, social validity, generalization). In addition, the lower quality of some aspects in some of the reviewed studies may also compromise some of the conclusions regarding functional relations established or experimental effects observed (e.g., use of non-experimental designs). It is of extreme importance to assess the methodological strengths and weaknesses of the research base evaluated by the present review, in combination with reported studies' outcomes, when determining the overall effectiveness of brief performance feedback as a training approach for paraeducators supporting students with ASD and/or other intellectual disabilities.

2.4.4 Limitations and Recommendations for Future Research and Practice

2.4.4.1 Literature review.

Several limitations should be considered when interpreting findings of the present review. First, with respect to the methods and procedures of the present review, no reliability data were collected for the purposes of coding information from obtained articles. The first author of present review conducted all coding of information. In addition, despite employing a systematic approach to exhaustively identify studies relevant for the purposes of this review, some studies meeting inclusion criteria may not have been identified. Moreover, the present literature synthesis does not account for the results of identified group design studies due to its sole focus, per inclusion criteria, on relevant studies that used a single case methodology. However, future research could include, if available, the statistical results obtained in group research studies to the current single case base in order to conduct a more comprehensive evaluation.

2.4.4.2 Research base.

A limitation of the extant research base, and of extreme importance, relates to the scarcity of research that has evaluated BPF interventions or abbreviated training packages for paraeducators supporting students with ASD and/or other intellectual disabilities in school settings. Of the nine studies included in the present review, only seven focus on paraeducators as main participants in those studies. The two additional studies evaluated the performance of classroom teams which included at least one paraeducator. Only the results concerning paraeducator participants were included for the purposes of this review. Researchers must continue attempting to expand the research base regarding practical, effective, and efficient methods for training paraeducators in school settings. Additionally, considering the results of the present review, future research that further evaluates the effectiveness and efficiency of brief or abbreviated training methods for paraeducators must consider an overall greater methodological rigor and alignment to established indicators of quality (Horner et al., 2005; Kratochwill et al., 2013).

The results of the present review have provided some evidence of the potential effectiveness of PF alone interventions when training paraeducators. However, the literature base with respect to this area of research with paraeducators, in school settings, is very limited (Alavosius & Sulzer-Azaroff, 1986; Hagermoser Sanetti et al., 2007). Future research must continue attempting to provide evidentiary support of the potential effectiveness of PF alone interventions in attempts to establish effective and efficient training approaches for this population in school settings. Similarly, specific characteristics when implementing feedback alone interventions warrant further investigation in order to possibly maximize the potential effects of feedback alone interventions when training paraeducators in schools (e.g., method of delivery,

Barton & Wolery, 2007; Luck et al., 2018; temporal location of feedback, Aljadeff-Abergel, Peterson, Wiskirchen, Hagen, & Cole, 2017).

Additionally, there exists some ambiguity when determining which single strategy is most effective, when combined with feedback, at increasing paraeducator treatment integrity of targeted interventions (Ward-Horner & Sturmey, 2012). While the outcomes of the present review may be varied at suggesting positive effects of different strategies, identification of most potent and reliable combinations must be attempted. Therefore, comparative studies are needed in order to determine which strategy produces most powerful results for the effective design of effective and efficient training interventions for paraeducators supporting students with ADS and/or other intellectual disabilities in school settings.

Finally, the gap between research and practice is particularly problematic in special education, as learners with ASD or other intellectual disabilities require highly effective instruction and supports to reach their potential (Cook, Buysse, Klingner, Landrum, McWilliam, Tankersley, & Test, 2015). Therefore, school administrators, supervisors, and special educators should adhere to the utilization of effective, efficient, and feasible training approaches that employ procedure-based feedback to improve paraeducator instructional behavior and supports, and that ultimately result in maximized learning opportunities and skill acquisition of the students they support.

2.5 Conclusion

The review of the literature related to the implementation of BPF interventions when training paraeducators supporting students with ASD and/or other intellectual disabilities has suggested the likelihood of these interventions as being equally effective but perhaps more

practical and efficient than other established multicomponent training models (e.g. BST). Considering the need to solidify effective and efficient training approaches for paraeducators as well as increase the feasibility of paraeducator training in school settings, the effect of BPF interventions and their characteristics warrant further evaluation. Future research must continue to investigate the effectiveness of feedback interventions that are brief, practical, efficient, and that are likely to produce equally effective outcomes on the instructional behavior and supports of paraeducators serving students diagnosed with ASD and/or other intellectual disabilities in school settings.

3.0 Dissertation Study

The purpose of the study below is to address some of the limitations and future directions suggested by the literature synthesis conducted regarding the potential effectiveness and efficiency of BPF interventions on paraeducators' implementation of targeted interventions when working with students with ASD and/or other intellectual disabilities. In addition, this study attempts to extend the research base regarding the effectiveness of BPF interventions by replicating the effects and procedures employed by past research in this area (e.g., Gilligan et al., 2007; Leblanc et al., 2005; Mazharova et al., 2012; Madzahrova et al., 2018; Robinson, 2011). Moreover, this study aims to compare the effectiveness and efficiency of a BPF intervention consisting of vocal verbal, post-session performance feedback (Leblanc et al., 2005) with the implementation of a skill rehearsal component only after implementation errors have occurred (Gilligan et al., 2007) to other established, more comprehensive training methods (i.e., BST), when training paraeducators to implement targeted interventions or other instructional strategies (i.e., errorless teaching) for students with ASD and/or other intellectual disabilities.

Specifically**,** when teaching paraeducators to implement an errorless sequence to teach tacts, intraverbal, and listener responding skills (Carbone, 2003) to students with ASD using BPF intervention, pre-session BST, or typed instructions, the present study attempts to answer the following questions: (1) what is the difference of the effectiveness and efficiency of BPF, BST and Typed Instructions with respect to paraeducators' frequency of correctly implemented errorless teaching sequences taught to students with ASD? (2) what is the difference of the effectiveness and efficiency of BPF, BST, and Typed Instructions with respect to paraeducators' percentage of correctly implemented errorless teaching sequence steps? (3) what is the difference

in paraeducators' maintenance of implementation of errorless teaching procedures to teach tact, listener responding, and intraverbal skills to students with ASD, post-training termination?

3.1 Method

3.1.1 Participants and Settings

3.1.1.1 Participants selection and screening.

Upon approval by the University of Pittsburgh's Institutional Review Board (IRB), the primary investigator (PI) obtained paraeducators' email lists from the participating schools and contacted them via email for voluntary participation. Criteria for inclusion in the present study consisted of the following: (a) having the title of paraeducator, paraprofessional, classroom assistant, classroom aid, or instructional aid; (b) be a member of a classroom team supporting students with ASD and/or other intellectual disabilities; (c) spend at least 75% of their responsibilities in a special education classroom supporting multiple students with ASD and/or other intellectual disabilities; and (d) not having received any formal training in the application of principles of applied behavior analysis (ABA), applied verbal behavior other than traditional teacher training conducted in the classroom, or the implementation of errorless teaching procedures to teach target verbal skills to students with ASD. For responders who met criteria, they were accepted into the study in the order in which they responded. Recruitment stopped once the number of participants for this study was met.

Following the selection of participants, the PI conducted a single screening session with the selected participants to determine their level of performance with the implementation of

errorless teaching procedures. This was done prior the beginning of the study and without the provision of any training. During the screening session, the PI asked the participant to implement errorless procedures to teach the target verbal skills during a mock instructional session. The PI took the role of a student and also collected data regarding the number of correct errorless sequences correctly taught across target verbal skills and the percentage of errorless sequence steps correctly taught during the observation session. The screening session duration lasted 5 minutes. In order to participate in the study, the selected paraeducators would to display performance lower than 30% correct implementation of steps. Across target skills, Elizabeth's performance during the screening session was 11%, Mary's and Caroline's performance during the screening session reached 9%. Mean percentage of correct implementation across participants, during the screening session, was 10%. An additional potential participant was screened for participation in the current study; however, she did not meet criteria due to her implementation of errorless teaching procedures across the target verbal skills during the screening session exceeded the established criterion for participation in the study (i.e., 61%).

3.1.1.2 Paraeducator participants.

Table 1 provides information regarding the paraeducator participants in this study. Three paraeducators participated in this study. Elizabeth was a 22-year-old, Caucasian female who fulfilled the role of a paraeducator in a local charter school. She had been recently hired by the school, at the beginning of the study, and had no prior experience in her role as a paraeducator nor supporting students with disabilities in the past. She spent most of her day supporting one student diagnosed with ASD in her respective special education classroom and special activities around the school. Mary was a 58 years-old, Caucasian female who fulfilled the role of a paraeducator in a special education classroom (i.e., autism support classroom) at a local private school for children

with intellectual disabilities. Mary had three years of experience as a paraeducator supporting students with disabilities at the onset of the study. Mary spent the entire day supporting 4-5 students diagnosed with ASD and/or other intellectual disabilities in a special education classroom and special activities around the school. Lastly, Caroline was a 35 years old, Caucasian female. She fulfilled the role of a paraeducator at a local charter school. As in the case of Elizabeth, Caroline did not have prior experience as a paraeducator supporting student with ASD and/or other disabilities. Caroline supported two students with disabilities, one of them diagnosed with ASD, in the special education classroom and during special activities during the school day. All participants had some familiarity with their respective student's programs, but no formal training regarding application of principles of ABA/applied verbal behavior, or implementation of errorless procedures during discrete trial training had been provided, other than traditional, introductory classroom training by the supervising special educator. Participation in this study was voluntary and each participant consented participation.

Table 1. Paraeducator demographic information

Name	*Gender*	*Age*	*Race*	*Years of Experience*	*Highest Education Attainment*	*Number of Students Supported*	*Setting*
Elizabeth	Female	22	Caucasian	0	Some college	2	Local Charter School
Mary	Female	58	Caucasian	4	Some college	5	Approved Private School
Caroline	Female	35	Caucasian	0	Some college	2	Local Charter School

3.1.1.3 Student participants.

In addition to the three paraeducators who participated in this study, three students diagnosed with ASD (i.e., two male and one female) participated in the study. Paraeducator-student dyads were established for the duration of the study. Charly was a six-year-old boy diagnosed with ASD who attended a local charter school. His typical day included spending a portion of the day in the special education classroom where he received intensive language training as well as spending another portion of the school day inclusion for special activities. Charly used vocal-verbal language to communicate. He was able to mand for approximately 15-20 desired items or activities, tact approximately 50-70 of pictures of common items as well as a few ongoing actions. Charly was able to engage in a few basic intraverbal responses (i.e., fill in responses) and complete a number of directions as a listener (e.g., touch your nose, show me clapping). Lastly, Charly demonstrated ability to perform some basic pre-academic tasks (e.g., tact and listener letter identification) and he could complete self-help routines with minimal assistance. Charly was paired with Caroline for the duration of the study.

The second student participant in this study was Ronny. Ronny was also a six years old boy and was also diagnosed with ASD. He attended a local private school for children with intellectual disabilities. Ronny spent the majority of his day in his special education classroom where he received, primarily, intensive language training. He also participated in additional special activities and related services throughout the school day. Ronny also communicated using vocal-verbal language. He demonstrated ability to mand for approximately 20 preferred items and activities, tact approximately 20-30 pictures of common objects as well some actual common objects. In addition, Ronny was able to produce some basic intraverbal responses in the form of fun fill-in responses (e.g., ready set…go) as well as follow to some basic directions and identify

some body parts as a listener (e.g., clap, touch head). Ronny also demonstrated ability to complete some basic pre-academic tasks (i.e., listener identification of letters). Last, Ronny needed some assistance in order to complete self-help routines. Ronny was paired with Mary for the duration of the study.

The last student participant in this study was Amy. Amy was a seven-year-old girl also with a diagnosis of ASD. She attended a local charter school and spent a portion of her instructional day in the special education classroom where she received intensive language training. In addition, as in the cases of Charly and Ronny, Amy also participated in special activities throughout the school day and received related services. Amy was able to mand for approximately 10-15 items as well as tact approximately 30-40 pictures of common items as well as actual objects. Similarly, as in Charly's and Ronny's cases, Amy was able to produce basic intraverbal responses in the form of filling in responses (e.g., the wheels on the bus go…. round) and follow some single-step directions as a listener. Amy was able to tact letters and some sounds of letters. Amy was paired with Elizabeth for the duration of the study.

It is important to note that goals and objectives for language training programming for all students was based on the Verbal Behavior Milestones Assessment and Placement Program (VBMAPP; Sundberg, 2008). Additionally, all student participants demonstrated some form of mild to moderate problem behavior (e.g., non-cooperative responses, refusal); however, the level and intensity of problem behavior was mild to moderate. Last, even when students also participated in this study, no student measures were assessed, nor was data formally collected on student outcomes for the purposes of this study.

3.1.1.4 Setting.

The study was conducted in two different schools located in the western Pennsylvania region. One local, elementary charter school and one private school for children with autism and/or other intellectual disabilities served as the participating sites. The training setting was a separate room (usually a therapy room in both sites). These rooms were equipped with a table and 3-4 small chairs, in addition to the students' instructional materials and preferred items. During days in which these separate rooms were occupied or not available, observation and training sessions were conducted in the actual special education classroom in an experimenter-arranged area. These areas were equipped with a small divider, a table, 2-3 chairs and the students' instructional materials and preferred items.

3.1.2 Materials

3.1.2.1 Preference assessments.

Student-specific preferred items were used to deliver as potential reinforcers contingent upon student's correct performance on selected target skills. The PI conducted a multiple stimulus preference assessment without replacement (MSWO; DeLeon & Iwata, 1996) for all the students at different times during the study to identify student-specific preferred items. Initially, the PI provided the supervising special education teacher and the paraeducator a preferred stimulus survey to complete. Based on the information provided on the preference stimulus survey, the PI conducted the MSWO with each student. The MSWO preference assessments were conducted once at the beginning of the study for each student. Additional brief preference assessments (i.e., MSWO) were conducted when observed that preferred stimuli selected for training were no longer of interest or valuable to the students.

3.1.2.2 Data collection.

Additional materials used during the study included: (a) paper datasheets/checklists, that included all definitions and steps of errorless sequence to teach target skills (i.e., tact, intraverbal, listener responding), were used to record the paraeducators implementation fidelity data during baseline and intervention sessions; (b) pen/pencils; (c) a timer that was used to record BPF and BST intervention time as well as observation session duration. Moreover, (d) a BPF intervention script was used during the intervention phase of the study, (e) checklists containing the instructional behavior of the PI, during baseline and intervention phases of the study, were used to collect treatment fidelity of intervention procedures, and (f) typed instructions, with detailed operational definitions of each of the steps of the errorless sequences for each selected target skills, were employed during the delivery of two of the training interventions evaluated in this study (e.g., BST and instructions). Lastly, a paper copy of the Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian**,** 1992) as well as an experimenter-developed questionnaire were used in the later stages of the study to collect data regarding social validity and participant acceptability of the intervention procedures.

3.1.2.3 Students' instructional materials.

Students' instructional materials consisted of two-dimensional pictures of common objects, three-dimensional common objects, and 3x5 colored index cards.

3.1.3 Dependent Variable and Measurement

The DVs assessed in this study included (a) the frequency of correct and incorrect errorless teaching sequences taught by paraprofessionals, to teach tact, intraverbal, and listener responding

targets (Carbone, 2003), during a ten-minute language training session; and (b) the percentage of correct errorless teaching sequence steps implemented by paraeducator participants when teaching specific targets within each selected target verbal skills (i.e., tact pictures of common items, listener responding of actions, and intraverbal) to student participants with ASD and/or other intellectual disabilities during the ten-minute session. Measurement of the frequency of correct and incorrect errorless teaching sequences occurred by the PI directly observing paraeducators' instructional performance during the ten-minute language training session and hand tallying, on the language training session's data collection sheet, every occurrence of a correct/incorrect errorless teaching sequence performed by the paraeducator participant.

Table 2 provides a detailed description of errorless teaching sequences across tacts, listener responding, and intraverbal skills. A correct errorless teaching sequence to teach tacts of pictures of common items consisted of the following steps: (a) presentation of non-verbal discriminative stimulus (S^D) in combination of vocal verbal instruction "what is it?" for the tact skill targeted; (b) presentation of an immediate or 0 second delay echoic prompt (the paraprofessional saying the full name of the targeted noun); (c) contingent upon student's response, re-presenting non-verbal S^D in combination with verbal instruction "what is it?" WITHOUT the established prompt; (d) presentation of two easy or mastered language-based trials; (e) re-presenting the non-verbal S^D in combination with the vocal verbal instruction "what is it?" WITHOUT the established prompt; and (f) delivers preferred item/reinforcer contingent upon student's correct response and within three seconds of student's correct response. Similarly, the correct errorless teaching sequence for teaching listener responding actions targets consisted of the following steps: (a) presentation of a vocal verbal S^D (e.g., "touch your nose"); (b) presentation of an immediate or 0 second delay imitation prompt (e.g., the paraprofessional touches his/her nose); (c) contingent upon student's

response, re-presents the vocal verbal S^D WITHOUT the established prompt; (d) presents two easy of mastered language-based trials; (e) re-represents the target vocal verbal SD WITHOUT the established prompt; (f) delivers the preferred item/reinforcer contingent upon correct responding and within three seconds of student's correct response. Lastly, the errorless teaching sequence for teaching intraverbal targets included the following steps: (a) presentation of a vocal verbal S^D (e.g., "tell me something you eat"); (b) presentation of an immediate or 0 second delay tact picture prompt (e.g., immediate presentation of a picture of a cookie); (c) contingent upon student's response, re-state vocal verbal S^D WITHOUT the established prompt; (d) presentation of two easy or mastered language-based trials; I re-presenting the vocal verbal S^D (e.g., "tell me something you eat" WITHOUT the established prompt (f) delivery of the preferred item/reinforcer contingent upon student's correct responding.

Table 2. Errorless teaching sequences steps

Tact Picture Errorless Sequence	*Listener Responding Action Errorless Sequence*	*Intraverbal Errorless Sequence*
Presentation of non-verbal S^D (picture) + instruction "What is it?	Presentation of vocal verbal S^D (e.g., touch your nose)	Presentation of vocal verbal S^D (e.g., tell me something you eat)
Presentation of 0-second delay prompt (echoic)	Presentation of 0-second delay prompt (i.e., imitative)	Presentation of 0-second tact picture prompt (e.g., picture of cookie- no vocal)
Re-state non-verbal SD + instruction "what is it? – no prompt (contingent upon response)	Re-presents vocal verbal S^D (contingent upon response) – no prompt	Re-state vocal verbal S^D – no prompt (contingent upon response)
2 easy or mastered trials	2 easy or mastered trials	2 easy or mastered trials
Re-state non-verbal SD + instruction "what is it? – no prompt (contingent upon response)	Re-presents vocal verbal S^D – no prompt	Re-presents vocal verbal S^D – no prompt (contingent upon response)
Delivers preferred item	Delivers preferred item	Delivers preferred item

With respect to the percentage of correct errorless teaching sequence steps, measurement of this DV occurred via direct observation of paraeducator performance when teaching the five targets across tacts, listener responding, and intraverbals. The PI completed a checklist containing all steps necessary for paraeducator participants to implement the errorless sequence to teach the targeted skills. See Figures 7-9 for a visual representation of the tact, listener responding, and intraverbal errorless sequence datasheets. During the observation, the PI recorded all steps correct and incorrectly performed by the paraprofessional participants, as they occurred. Immediately following the 10-minute observation, the percentage of correctly implemented errorless sequence steps to teach the target skill was calculated by dividing the ratio of correct steps by correct steps plus incorrect steps and then multiplying by 100. It is worth noting that all data collected for the purposes of this study, was recorded in vivo by the PI, and with observation/data collection sessions occurring 2-3 times per week.

3.1.4 Independent Variable

The present study evaluated three different independent variables. The first independent variable involved the evaluation of a BPF intervention consisting of post-session vocal verbal PF, as suggested by (Leblanc et al., 2005) with a component of skill rehearsal as corrective feedback only, as suggested by Gilligan et al. (2007). During BPF, an intervention script consisting of behavior specific praise for steps correctly implemented and verbal corrective feedback for steps implemented incorrectly was used to ensure feedback delivery and the quality of feedback provided was consistent across participants. See Figures 10-12 for a detailed description of the performance feedback intervention script across target verbal skills. In addition, skill rehearsal was a component included in training to provide participants with opportunities to practice incorrectly

performed steps and occurred following post-session PF. The second independent variable evaluated in this study consisted of the implementation of a pre-session, BST package (Sarokoff & Sturmey, 2004; 2008). The BST package involved reading instructions followed by review of those instructions by the PI, modeling of the target skill by the PI, skill rehearsal by the participant, and PF. Lastly, typed instructions was evaluated as a control condition for the purposes of this study.

3.1.5 Experimental Design

A single subject adapted alternating treatments design (AATD; Sindelar, Rosenberg, & Wilson, 1985) was used to evaluate the effects of the IVs on the selected DVs for the purposes of this study. The reason for the selection of this research design lied in that the ATDD allows for the comparison of the effect of training interventions (non-reversible behaviors) on paraeducator performance (Ledford & Gast, 2018). Counterbalancing of IV-target skill combinations was conducted across the three paraeducator participants in this study in order to minimize potential threats to internal validity (e.g., sequence effects). For example, Elizabeth was trained to teach tacts of pictures of common stimuli using BST, listener responding of actions using BPF and intraverbal targets using typed instructions (i.e., control measure) Similarly, Mary was trained to teach listener responding of actions using BST, intraverbal targets using BPF and tact of pictures of common items using typed instructions (i.e., control measure). Lastly, Caroline was trained to teach intraverbal targets using BST, tact of pictures of common items using BPF, and listener responding of actions using typed instructions (i.e., control measure; see Table 3 for details regarding counterbalancing of IV/target skill combinations). In addition, during the study, treatment interference effects were minimized by attempting to increase, to the greatest possible

extent, the amount of time between delivery of each training strategy, (Ledford & Gast, 2018). For example, each strategy presentation for participant one occurred after at least thirty minutes of delivery of the previous training strategy. Moreover, potential effects of time of the day intervention delivery were counterbalanced by alternating the presentation of interventions within and across observation days (e.g., BPF presentation in the morning of day one and in the afternoon on day two; see Table 4 for details regarding schedule of intervention delivery). Participants introduction to the intervention condition was based on low level, stable performance during the baseline condition with respect to the frequency of correct errorless teaching sequences performed by paraeducators (Johnston & Pennypacker, 2008). Training was terminated for participants after teaching at least ten correct errorless teaching sequences, across the five targets selected for acquisition, in each verbal skill taught (i.e., tact, listener responding, and intraverbal) with no errors for three consecutive observation days (100% implementation fidelity; Ledford & Gast, 2018). It is worth noting that if one of the training strategies evaluated (i.e., BFP or BST) met training termination before the other, the less effective training strategy continued to run for 1.5 the number of sessions it took the more effective strategy to meet training termination. If the less effective training strategy reach termination within the established additional number of sessions, then the training was discontinued. If training termination was not met after the established additional number of sessions, then training was then discontinued (Ledford & Gast, 2018). During this time, data was also collected consistently on the training strategy assigned to the control condition (i.e., typed instructions) until the training for the other strategies was discontinued (Ledford & Gast, 2018).

Table 3. Counterbalancing IV/target skill combinations

Participant	*Independent variable/Target Skill*	*Control (Instructions)*
Elizabeth	BPF/ Listener Responding	Intraverbal
	BST/ Tact of pictures	
Mary	BPF/ Intraverbal	Tact of pictures
	BST/ Listener Responding	
Caroline	BPF/ Tact of pictures	Listener Responding
	BST/ Intraverbal	

Table 4. Schedule of intervention delivery

Participant	*Obs. Day 1*	*Obs. Day 2*	*Obs. Day 3*	*Obs. Day 4*
Paraprofessional 1	**BPF** (LR) 8:30 am	**Control** (IV) 8:30 am	**BST** (tact) 8:30am	**Control** (IV) 8:30am
	BST (tact) 9:30 am	**BPF** (LR) 9:30 am	**Control** (IV) 9:30am	**BPF** (LR) 9:30am
	Control (IV) 10:30 am	**BST** (Tact) 10:30 am	**BPF** (LR) 10:30am	**BST** (Tact) 10:30am
Paraprofessional 2	**BST** (LR) 11:30 am	**Control** (Tact)11:30am	**BPF** (IV) 11:30am	**BST** (LR) 11:30am
	Control (tact) 12:30pm	**BPF** (IV) 12:30pm	**BST** (LR) 12:30am	**Control** (tact) 12:30pm
	BPF (IV) 1:15pm	**BST** (LR) 1:15pm	**Control** (Tact) 1:15pm	**BPF** (IV) 1:15pm
Paraprofessional 3	**Control** (LR) 9am	**BPF** (Tact) 9am	**BST** (IV) 9am	**Control** (LR) 9am
	BPF (Tact) 10 am	**Control** (LR) 10am	**BPF** (Tact) 10am	**BPF** (Tact) 10am
	BST (IV) 2:30 pm	**BST** (IV) 2:30pm	**Control** (LR) 2:30pm	**BST** (IV) 2:30pm

Note: Time intervals are not exact and varied based on paraeducator-student scheduled of activities. Thirty minutes interval between intervention delivery remained constant.

3.1.5.1 Task equivalence.

Consistent with the logic of the single subject research AATD (Sindelar et al., 1985), the difficulty of implementation of the errorless teaching sequences to teach target skills (i.e., tacts, listener responding, and intraverbal skills) as well as the difficulty in the teaching and performance of each target skill was evaluated to ensure that behavior chains/sets taught by paraprofessional participants are functionally similar, independent, and of equal difficulty (Ledford & Gast, 2018). With respect to the errorless teaching sequence to teach target tacts, listener responding, and intraverbals, an analysis of each sequence was conducted in terms of the number of steps (all sequences consisted of six steps) and the paraprofessionals' responses associated with each step of the sequence (e.g., the use of echoic prompt to teach tact; the use of imitation prompts to teach listener responding). In addition, opinions of two Board Certified Behavior Analysts-Doctoral level (BCBA-D) and one senior, masters level Board Certified Behavior Analyst (BCBA) were obtained. All three were experts in the application of behavioral principles as well as the design and delivery of language training interventions based on Skinner's analysis of verbal behavior (Skinner, 1957). Their opinions were obtained regarding the equivalence of each of the errorless teaching sequences, particularly the function of each sequence, number of adults required, number of steps in each sequence, and an overall assessment of the difficulty and equivalence of each errorless teaching sequence. All experts (100%) agreed that the function of the errorless teaching sequence was instructional in nature. In addition, all experts (100%) agreed that all targeted sequences included the same number of steps and did not involve additional individuals to be implemented. Two of the experts (67%) did not find meaningful differences across the three errorless teaching sequences, while one of the experts did (e.g., type of prompt use to teach specific verbal skills). Overall, no expert considered one errorless teaching sequence to be more difficult

to implement than the others. Similarly, with respect to the target verbal skills taught by paraprofessionals (i.e., tact, listener responding, and intraverbal), all experts agreed that each of the target skills to be taught by paraprofessionals to be basic verbal operants that do not require multiple verbal conditional discriminations. In addition, experts agreed on the equivalence of each target skill if taught as a basic verbal operant, not requiring multiple verbal responses or responses that involve multiple conditional discriminations. See Table 5 for details regarding experts' task equivalence assessment.

Table 5. Task equivalence form

	Item	*Errorless Sequence Tact of Pictures*	*Errorless Sequence Listener Responding Actions*	*Errorless Sequence Intraverbal*
1.	What is the function or purpose of the strategy? (e.g., instructional, behavior management?			
2.	What does the topography of the strategy include? (e.g., verbal instruction, motor representation, gestural direction, physical redirection)			
3.	Does the strategy require any additional adults aside from the adult implementing the strategy?	Yes No	Yes No	Yes No
4.	In order to implement each strategy, are any tangible materials **required**?	Yes No	Yes No	Yes No
5.	Do any of these strategies require organization and preparation of materials other than skills targeted?	Yes No	Yes No	Yes No
6.	Are each sequence considered a "free operant" in that specific environmental conditions **DO NOT** need to be in place prior to implementation of the sequence?	Yes No	Yes No	Yes No
7.	Is there an equal number of steps in the sequence for each of these strategies?	Yes No	Yes No	Yes No
8.	Do any of the strategies appear to be more difficult to implement than the others? If so, please describe.	Yes No If yes, please explain:		

3.1.6 Procedures

3.1.6.1 Pre training.

At the beginning of each observation session, for the first two observation days during the baseline condition, all paraeducator participants received training and guidance related to reducing the effect of the conditioned motivating operation – reflexive (CMO-R; Carbone, Morgernsten, Zecchin-Tirri, & Kolberg, 2010). Each session lasted approximately five minutes prior the beginning of the observation session. This training was done due to that the student participants displayed problem behavior in the form of non-cooperative behaviors and paraeducators not having established instructional control at the onset of the study. Skills trained included establishing approach behavior, free delivery of preferred stimuli prior trial presentation, differential reinforcement of cooperative behavior, and beginning sessions with opportunities for students to engage in mand behavior (Carbone et al., 2010). It is important to note that no skill or aspect covered during this training interfered or related to the paraeducator target skills for the purposes of the present study (i.e., errorless teaching procedures).

3.1.6.2 Student target selection.

Prior the beginning of experimental phases of the present study, the PI, together with the supervising special education classroom teacher developed a list of 10-20 unknown targets for each of the targeted verbal and non-verbal skills (i.e., tact of pictures of common stimuli, listener responding of actions, and intraverbal). Only five targets per skill area trained (i.e., tact, intraverbal, listener responding) were selected for paraeducator implementation at any given time. It is important to note that all students' targets were obtained from each students' current tact,

listener responding, and intraverbal training programs. In addition, students' targets selected for acquisition, for the purposes of this study, were only taught by paraeducator participants.

3.1.6.3 Probe sessions.

The PI conducted probe sessions in order to ensure paraeducators taught unknown skills to their respective students. Prior the beginning of each observational session with paraeducator participants, across experimental phases of the study, the PI probed each of the skills selected for teaching. During the probe session, the PI presented each of the targeted skills to the student participants with without any prompting strategy. If the student participant responded correctly, within 3 seconds, to the stimulus presented then the PI delivered praise and recorded the response for that specific targets as correct on an experimenter-developed probe datasheet (e.g., Y on probe sheet). Similarly, if the student responded incorrectly, the PI recorded the student's response as incorrect (e.g., N on probe sheet). Mastery of a selected target occurred when the student correctly responded to the target skill over two consecutive probe sessions. Immediately following, the PI along with the special educator, selected the next target for acquisition for that respective student. Across the three students who served as participants in this study, a total of 11 selected targets for students were mastered (i.e., Amy = 2; Ronny = 5; Charly = 4, respectively).

3.1.6.4 Baseline.

At the onset of the observation session and following the probe procedure, the PI provided the paraeducator with the set of 5 targets and labeled according to the specific skill to teach during that specific observation session (e.g. tact targets) as well as a set of cards (pictures and 3x5 index cards) with mastered skills for that student and guided the participant to set up into two piles. Following, the PI instructed the paraeducator participants "you can begin teaching the targets –

teach as many as you can during the session" and began timing the session duration. During this period, the PI collected data on the selected dependent variables for the purposes of this study (i.e., frequency of correct errorless teaching sequences and percentage of correctly implemented steps). If the participant finished teaching the five selected targets and had time left in the session, the PI reminded the participant to "teach as many targets as possible during the 10-minute session"). The session concluded immediately following the timer signaling the end of the ten-minute session. If, during this phase, the paraeducator did not engage in any instructional behavior with a specific target for approximately one minute, then the PI asked the paraeducator participant to move on to the next target. At the conclusion of this session, the PI thanked the participants for their time and reminded them that the next observation session would occur after at least 30 minutes had elapsed. During baseline, paraeducator participants did not receive any form of training or feedback, prior or following instructional performance, nor PI answered any questions related to the participants' instructional performance or study procedures.

3.1.6.5 Intervention.

During the intervention phase of the study, evaluation of the independent variables (i.e., BPF; BST) was conducted, as well as the evaluation of the additional intervention (i.e., typed instructions) established as a control measure. Intervention-skill combinations were purposefully arranged in order to minimize potential sequencing effects (e.g., Elizabeth was trained to teach listener responding of actions using BPF; tact of pictures using BST; and intraverbal targets using typed instructions (i.e., control measure); Mary was trained to teach intraverbal targets using BPF; listener responding actions using BST and tact targets using typed instructions; and Caroline was trained to teach tact targets using BPF, intraverbal targets using BST, and listener responding targets using typed instructions). Similarly, in attempts to minimize potential treatment

interference effects, training sessions occurred after at least a 30-minute interval of the presentation of the previous training session each day. It is important to note that, throughout the study, time between instructional observations and/or training presentation to paraeducators ranged from 30 minutes to three hours. This was primarily due to students' and paraeducators' schedule of activities and availability as well as the PI's travel time between participating sites. Last, potential effects of time of the day intervention delivery were counterbalanced by alternating the presentation of interventions within and across observation days (e.g., BPF, then BST, then instructions on day one; BST, instructions, instructions, and last BPF on day two).

3.1.6.5.1 Brief performance feedback.

The PI employed the same procedure as in baseline during the observation session. Immediately following the end of the ten-minute language training session, the PI started a timer and began with the BPF intervention. During the BPF intervention, the PI provided vocal-verbal behavior specific praise for all steps completed correctly and the quality of performing those steps (e.g., "you did a nice job providing a prompt immediately following your verbal instruction"; "you did a nice job prompting the tact using an echoic prompt"), as well as corrective feedback with explanations of the skills implemented incorrectly (e.g., "you did not re-present the S^D after the prompted trial). During BPF, the PI used an intervention script in order to ensure consistency of feedback delivery across paraeducator participants. Following post-session vocal-verbal feedback, the PI provided the paraeducator with two opportunities to practice skills incorrectly performed of the errorless teaching sequence during the session. During skill rehearsal, the PI verbally labeled or described the incorrectly performed step and asked the participant to role-play it with the PI. The PI provided immediate praise or corrective feedback following the practicing the skill with the participant. During this time, the PI also answered questions generated by paraeducator

regarding procedural implementation. It is important to note that the PI did not employ any additional strategy while training the paraeducator (e.g., modeling or written instructions). At the conclusion of BPF, the stopped the timer used to record BPF training duration and recorded the duration of the feedback session on the session datasheet. Lastly, the PI thanked the participant for their time and reminded them of the occurrence of the next training session after at least 30 minutes had elapsed. For all paraeducator participants, the first BPF session occurred immediately following the last baseline session.

3.1.6.5.2 BST.

Prior the beginning of the language training session, the PI met with the paraeducator participant and began the training session. At the onset, the PI started a timer in order to record the duration of the training session. BST training began by the review of a checklist that contained all steps and definitions of all of the steps involved in the errorless sequence to teach the specific target selected for training. Following this step, the PI modeled the implementation of the errorless sequence to teach the specific targets three consecutive times. Following, the PI asked the paraeducators to rehearse, with the PI, the errorless sequence modeled. PF, in the form of behavior specific praise and corrective feedback was provided following participants demonstration of the skill. Modeling, skill rehearsal, and PF continued until the paraeducator participant demonstrated correct implementation (i.e., 100% correct implementation of steps), during role play, for three PI selected targets from a training set. In addition, the PI answered training/procedure questions relevant to that specific training session only. Once the participant reached the mastery criteria for the training session then the observation session with the student was conducted. During the observation session, baseline procedures were in effect. The observation session continued until the timer signaled the end of the ten-minute session. Following, the PI thanked the participant for

their time and remind them that the next training session would occur after at least a 30-minute interval had elapsed. It is worth noting that following the teaching session with the student, neither modeling of any of the steps of the errorless sequence, skill rehearsal, nor post-session PF occurred.

3.1.6.5.3 Control condition.

Figures 13-15 exemplify typed instructions used as control condition during the study. Prior the beginning of the language training session with the student, the PI started a timer, provided typed instructions containing the steps of the errorless teaching sequence to teach tacts of pictures of common items, listener responding of actions and intraverbal targets with specific definitions of each of the steps, respectively, and asked the participant to read them. Following the paraeducator participant reading the instructions, the observation session began by the PI directing the participant to set up instructional materials and asking the paraeducator participant to "teach as many targets as possible during the 10-minute session", and concluded once the timer signaled the end of the ten-minute session. As in baseline, the PI thanked the participants for their time and reminded them that the next training session would occur after at least a 30-minute interval. No modeling, skill rehearsal, pre or post-session PF, or questions/answers occurred following typed instructions training.

3.1.6.6 Follow-Up.

Follow up sessions occurred once weekly for five consecutive weeks following training termination to assess the durability of effect of each of the training strategies employed for the purposes of this study over time. Baseline procedures were in effect during follow-up sessions.

3.1.6.7 Inter-Observer agreement.

Inter-observer agreement (IOA) data was collected on the measurement of the DVs selected for the purposes of the present study (i.e., frequency of correct/incorrect errorless teaching sequences during the ten minute session; percentage of correctly implemented errorless sequence steps when teaching tacts, listener responding, and intraverbal targets during the ten-minute session). IOA data collection was obtained in attempts to increase the believability of the data collected in this study. IOA data, in the present study, was collected by a second observer. The second observer was graduate student enrolled in the Doctor of Philosophy (PhD) in special education program at the University of Pittsburgh and was trained on the measurement of the DV(s) of this study. During IOA data collection, the second observer completed the checklist containing tact, listener responding, and intraverbal errorless sequence steps with the primary investigator but independently during the observation. Trial by trial IOA (Cooper, Heron, & Heward, 2020) was used in order to accurately record and compare each step of the respective errorless teaching sequence performed by the paraeducator participant. An agreement occurred when the PI and the second observer recorded as correct or incorrect the same behavior, or step of the observed errorless teaching sequence on the checklist. A disagreement occurred when the PI's and the independent observer's responses did not match on a specific behavior on the sequence. IOA data was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. In the present study, IOA data was collected for 39% of sessions distributed across baseline, intervention, and follow-up phases of the study and across all paraeducator participants. Mean IOA for Elizabeth, across phases of the study was 99.2%; mean IOA for Mary was also 99.2%; and mean IOA for Caroline was 98.4%. Total mean IOA, across the three paraeducator participants, across the phases of the present study was 98.9%.

3.1.6.8 Treatment fidelity.

Similarly, data on the PI's implementation of the three interventions selected (i.e., BPF; BST; typed instructions) was collected for the purposes of this study to ensure that the selected interventions were implemented as intended. Treatment fidelity data on the assessed IVs for this study was collected by a second observer. The second observer was graduate student enrolled in the Doctor of Philosophy (PhD) in special education program at the University of Pittsburgh and was trained on the implementation and measurement of the IVs of this study. During treatment fidelity data collection, the second observer completed checklists containing all behaviors needed to implement the IVs selected for this study (i.e., BPF, BST, Typed instructions) as well as the PI's behavior during non-instructional phases of the study (i.e., baseline and follow-up), in-vivo. See Figures 16-19 for details regarding checklists used to assess treatment fidelity across experimental phases of the present study. The second observer collected treatment fidelity data for 39% of observation sessions distributed across baseline, intervention, and follow-up. Mean treatment fidelity for PI's implementation of baseline procedures was 100%. Mean treatment fidelity for PI's implementation of procedures associated with the delivery of BPF was 100%. Mean treatment fidelity for PI's implementation of procedures associated with the delivery of BST was 100%. Similarly, mean treatment fidelity of PI's implementation of procedures for the delivery of typed instructions was also 100%. Lastly, mean treatment fidelity of PI's behaviors during follow-up sessions was 100%. Total mean for all treatment fidelity components, across phases of the present study, was 100%.

3.1.6.9 Social validity.

Data regarding the social validity and acceptability of procedures employed during this study were assessed across paraeducator participants. Participants were asked to complete the

Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992). The AARP is a seven item Likert-type rating scale which ranges from 1 (strongly disagree) to 6 (strongly agree). Total scores were obtained by summing all obtained scores in all items. Higher summed scores indicated a greater level of acceptability (i.e., maximum possible score is 42). Participants completed the AARP for each of the training interventions assessed for the purposes of this study. Similarly, following the conclusion of the study, the PI asked participants to complete an experimenter-developed questionnaire regarding specific information of each of the training strategies assessed during this study. Information gathered in this questionnaire not only provided information regarding the participants' acceptability of training procedures, but also, participants preferences towards specific training approaches and their perceptions regarding training effectiveness. See Figures 20-23 for details regarding instruments used to assess social validity for the purposes of this study.

3.1.7 Data Analysis

Data, for the purposes of this study, was visually analyzed in order to determine a functional relation between implementation of the IV(s) and changes in the DV(s) selected for evaluation. Visual analysis employed was consistent with the single subject research methodology and as suggested by indicators of quality (Horner et al., 2005; Kratochwill et al., 2013). Evidence experimental control, or a functional relation between DVs and IVs, was derived from the comparison of IVs selected for the purposes of this study (i.e., BPF, BST, and typed instructions), and the differentiation in response patterns observed among IVs evaluated in paraeducators' implementation of their respective target skills (Ledford & Gast, 2018). In addition, effectiveness of the independent variable(s) on paraeducators' implementation of target skills was evaluated by

assessing the level, trend, variability, immediacy of effect, overlap, and stability of the data across experimental phases of the study. This visual analysis then allowed to identify which of the IVs assessed produced the greatest change on the selected DVs and thus, determine which training strategy was most effective and efficient. No quantitative or statistical methodology was employed to analyze the data related to participants' performance across experimental phases of the study. However, descriptive statistics (i.e., AARP; Tarnowski & Simonian, 1992) as well as responses reported by paraeducator participants to the experimenter developed follow-up questionnaire were used to analyze the assessment of social validity for the purposes of the present study.

3.2 Results

3.2.1 Elizabeth

See Figures 1-2 for Elizabeth's data across conditions.

3.2.1.1 Baseline.

Data for Elizabeth during the baseline condition was collected for five consecutive observation days. During the baseline condition, mean number of correct errorless teaching sequences taught across tact, listener responding and intraverbal target skills was zero. Similarly, mean implementation fidelity of the errorless sequence (i.e., percentage of correctly implemented errorless sequence steps) to teach tacts, listener responding, and intraverbal skills was 9% for Elizabeth (i.e., 17% listener responding; 0% tact; and 12% intraverbal, respectively).

3.2.1.2 Intervention.

Elizabeth's results for BPF, BST, and Typed instructions are described below.

3.2.1.2.1 Brief performance feedback.

Elizabeth was exposed to the BPF intervention when teaching target listener responding of actions to her assigned student. Elizabeth reached training termination after three intervention sessions. It is important to note that an additional BPF training session was conducted due to that the skill trained under BPF for Elizabeth (i.e., listener responding) reached mastery sooner than the skill trained under BST (i.e., tact). This procedure was implemented as suggested by Ledford and Gast (2018). Elizabeth reached BPF training termination with a mean of 12 correct errorless sequences taught (range 10-13) and 100% correct implementation of steps. A large change in level, from baseline to intervention, was observed immediately following the first implementation of the BPF (i.e., from 17% in baseline for listener responding errorless sequence to 100%, after first BPF session).

3.2.1.2.2 BST.

Similarly, BST was employed to train Elizabeth to implement the errorless sequence to teach tacts of pictures of common items to her assigned student. Elizabeth reached mastery of the errorless sequence steps during the fourth intervention session. During the intervention phase, mean number of correct errorless sequences taught by Elizabeth was 11 (range 6-14), as well as 99.5% mean implementation fidelity of errorless sequence steps. It is worth noting that during the observation session following the first BST implementation, Elizabeth taught one errored sequence. Last, as in the case of BPF, implementation of BST procedures produced a large level change from baseline to intervention after the first BST training session (i.e., 0% to 98%).

3.2.1.2.3 Typed Instructions.

Typed instructions was used as a training strategy for Elizabeth to teach targeted intraverbal skills. During the intervention phase of the study, Elizabeth taught zero correct errorless sequences to teach intraverbal skills. In addition, mean percentage of correctly implemented errorless sequence steps to teach intraverbal targets was 39% (i.e., 29%-44% range). As noted, typed instructions did have an effect on implementation fidelity (i.e., after the first training session (i.e., 0%-40%); however, this change was not as large as the change observed for skills trained under BPF and/or BST, nor had an impact on the number of correct errorless teaching sequences taught.

3.2.1.3 Follow up.

3.2.1.3.1 Brief performance feedback.

Across the five follow-up sessions, Elizabeth taught an average of 12 correct errorless sequences when teaching listener responding targets post termination of BPF training. No error sequences were taught by Elizabeth during the follow-up phase of the study. Similarly, mean performance for Elizabeth across the five follow-up sessions with respect to the percentage of correctly implemented steps to teach the errorless sequence for listener responding targets reached 100% implementation fidelity.

3.2.1.3.2 BST.

As in the case of BPF, Elizabeth's mean number of correct errorless sequences to teach tacts across the five sessions during the follow-up condition was 13 correct sequences. As in BPF, no error sequences were taught by Elizabeth. Similarly, during follow-up sessions, Elizabeth maintained high levels of implementation with respect to the correct implementation of errorless

sequence steps to teach tacts. Mean implementation fidelity during the follow-up phase for Elizabeth was 100%.

3.2.1.3.3 Typed instructions.

No changes were observed with respect to the number of correct intraverbal sequences taught by Elizabeth during the follow-up condition (i.e., *M*= 0). Similarly, during the follow-up phase, Elizabeth's performance did not reach optimal levels of implementation fidelity, with a mean of 44% (i.e., 42%-52% range) across sessions in the follow-up phase.

3.2.1.3.4 Data Summary.

In the case of Elizabeth, a clear functional relation was established between BPF, BST, and Typed Instructions. Both interventions, BPF and BST, caused improved and consistent performance when compared to Typed Instructions as a training strategy. In addition, this was demonstrated by Elizabeth's instructional behavior reaching optimal levels for target skills trained under BPF and BST, and skills trained under Typed instructions showing only some improvements; however, not optimal. In addition, the comparison between BPF and BST, though not showing a drastic difference, demonstrated that BPF was more effective than BST, in that it produced an initial, slight larger effect than BST. In addition, the skill trained under BPF met training criterion sooner than BST. For both BPF and BST, once the participant reached optimal levels of implementation, thus reaching training termination, consistent, optimal levels of performance maintained through the maintenance phase of the study.

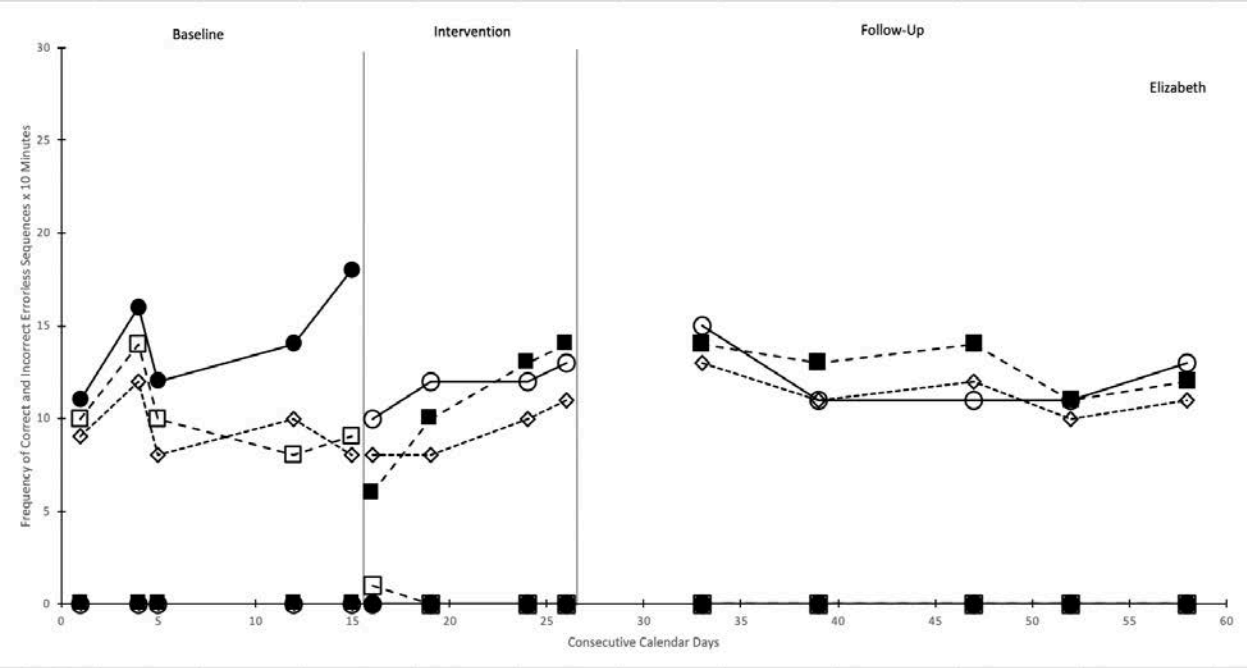

Figure 1. Frequency of correct and incorrect errorless sequences taught during 10-minute session by Elizabeth

Note: *BPF*- Brief Performance Feedback for errorless sequence for listener responding of actions*; BST*-Behavioral Skill Training for errorless sequence for tacts of pictures; Control – Typed instructions for intraverbals for Elizabeth. ○= correct BPF; ● = incorrect BPF; ■ = correct BST; □ = incorrect BST; ◆ = correct control; ◇ = incorrect control

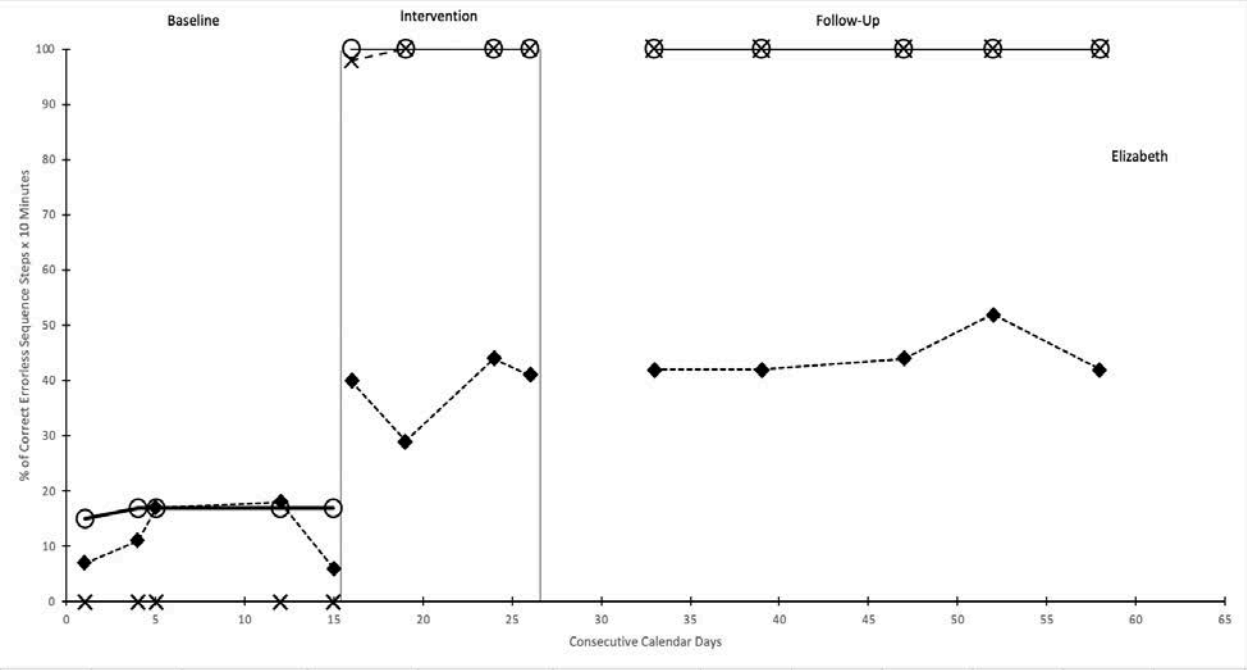

Figure 2. Percentage of correct steps implemented of errorless teaching sequences during 10-minute session for Elizabeth.

Note: *BPF*- Brief Performance Feedback for errorless sequence for listener responding of actions*; BST*-Behavioral Skill Training for errorless sequence for tacts of pictures; Control- Typed instructions for intraverbals for Elizabeth. . ○ = BPF; **X** = BST; ◆ = Control

3.2.2 Mary

See Figures 3-4 for Mary's data across conditions

3.2.2.1 Baseline.

Baseline for Mary also lasted for five consecutive observation days. During baseline, Mary taught zero correct errorless sequences across target skills (i.e., intraverbal, listener response, and tact), as well demonstrated performance related to the percentage of correct errorless teaching sequences, across target skills, of 16% (i.e., 16% intraverbal; 13% listener responding; and 17% tact, respectively).

3.2.2.2 Intervention.

Mary's results for BPF, BST, and Typed Instructions are described below.

3.2.2.2.1 Brief Performance Feedback.

The BPF intervention was used to train Mary to teach target intraverbal targets. Mary reached training termination after six interventions sessions. The mean frequency of correct errorless sequences taught by Mary to teach the target skill was 9 sequences (range 2-15). Errors occurred for the first three observation sessions (i.e., five, five, and two, respectively) during the BPF condition when teaching intraverbal targets. In addition, implementation fidelity of the errorless sequence steps to teach intraverbal targets averaged 90% during the intervention phase of the study. As in the case of Elizabeth, the implementation of the BPF training when teaching intraverbal targets for Mary also produced an immediate change in level from baseline to the first intervention session. However, the change observed was more moderate and with a gradual increasing trend until mastery (i.e., from 16% in baseline to 60% after first BPF session).

3.2.2.2.2 BST.

Mary displayed an immediate level change after introduction of the BST training (i.e., from 18% to 83% during the observation following the first BST session). BST was employed when training Mary to implement the errorless sequence for teaching listener responding of actions. BST lasted five sessions for Mary. As in Elizabeth's case with BPF, an additional training day was provided since Mary reached training termination one day before the BPF condition reached termination of training. This procedure was implemented as suggested by Ledford and Gast (2018). Across intervention sessions, Mary's mean number of correct errorless sequences when teaching listener responding of actions targets was 12 correct sequences (range 4-17) and the percentage of

correct errorless sequence steps to teach listener responding of actions target skills, during BST training, averaged 96%.

3.2.2.2.3 Typed Instructions.

Typed instructions was used to train Mary to teach tact targets. During the training condition of the study, Mary did not teach any correct errorless sequences when teaching tacts (*M*=0). However, Mary performance showed moderate improvements in implementation fidelity (i.e., percentage of correct errorless sequence steps) reaching a mean implementation fidelity of 51% (i.e., 40%-57% range) during the intervention phase of the study. As in the case of Elizabeth, there was an immediate change after the first implementation of the intervention with respect to the percentage of correctly implemented steps; however, no impact was observed regarding the number of sequences correctly taught.

3.2.2.3 Follow-up.

Mary's results during follow-up condition for each training strategy are described below.

3.2.2.3.1 Brief performance feedback.

Mary's mean number of correct errorless sequences when teaching intraverbal targets, during the follow-up condition was 12. Similar to Elizabeth, Mary made no errors in her implementation of the errorless sequence to teach intraverbal targets during follow-up (i.e., 100% implementation fidelity).

3.2.2.3.2 BST.

Similarly, Mary's mean number of correctly implemented errorless sequences to teach listener responding targets was 13. One error sequence was observed during Mary's instructional performance during the follow-up phase (i.e., during follow-up session three). Mean implementation fidelity of the errorless sequence to teach selected listener responding targets was 99.8%, across the five follow-up sessions.

3.2.2.3.3 Typed instructions.

Similar to Elizabeth, Mary's performance with respect to the number of correct errorless sequences taught, when using typed instructions as a training strategy to teach tacts, did not show any improvements during the follow-up phase of the study (M= 0). Mean implementation fidelity of the errorless teaching sequence to teach selected tact targets was 52% (i.e., 45%-58% range).

3.2.2.3.4 Data Summary.

In the case of Mary, a functional relation was also demonstrated between BPF, BST, and Typed Instructions. A clear differentiation in performance patterns were observed, during the intervention condition of the study, for skills training under BPF and BST than for skills trained under Typed Instructions. As in the case of Elizabeth, BPF and BST reached optimal levels of performance during training while typed instructions, as a training strategy, was observed to be ineffective at reaching optimal levels of implementation for Mary. For Mary, results of the study demonstrated BST as the more effective intervention over BPF in that larger initial changes were observed from baseline to intervention as well as reaching training termination sooner than then skill trained under BPF. Once training was terminated, for both BST and BPF, consistent, optimal levels of implementation were maintained over the follow-up phase of the study while typed

instructions remained at low to mid-levels with respect to implementation fidelity and zero levels with respect to the number of correctly errorless sequences taught.

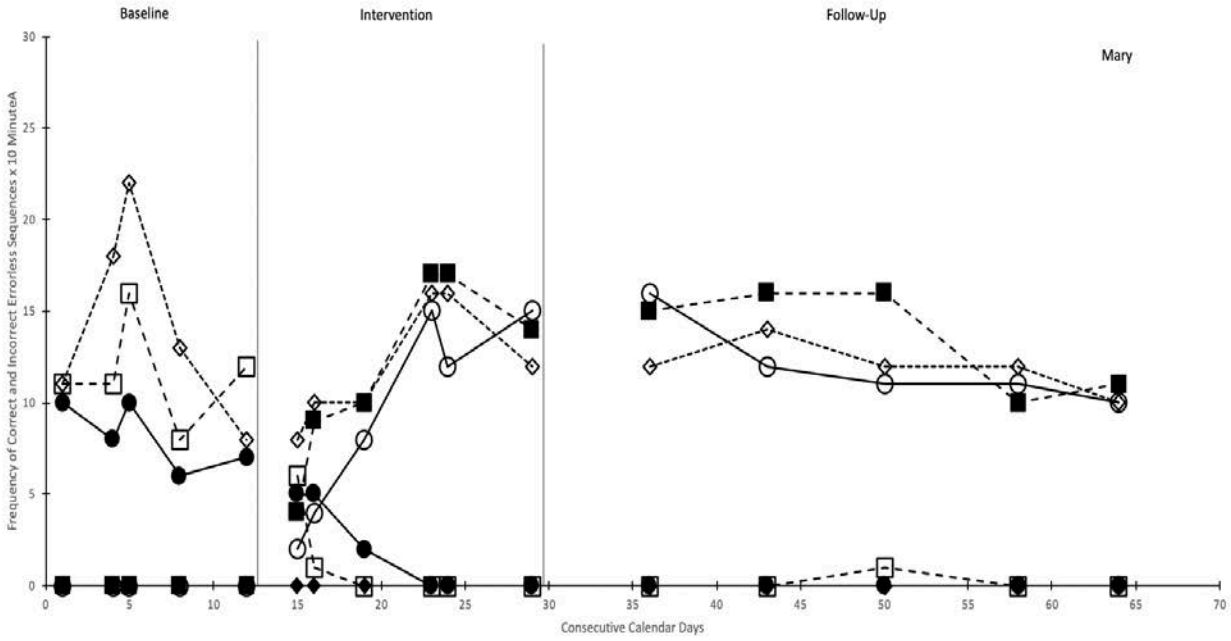

Figure 3. Frequency of correct errorless sequences taught during the 10-minute session by Mary.

Note: *BPF*- Brief Performance Feedback for the errorless sequence of intraverbals; *BST*- Behavioral Skills Training for the errorless sequence of listener responding of actions; Control- Typed instructions for tact pictures for Mary. ○ = correct BPF; ● = incorrect BPF; ■ = correct BST; □ = incorrect BST; ◆ = correct control; ◇ = incorrect control

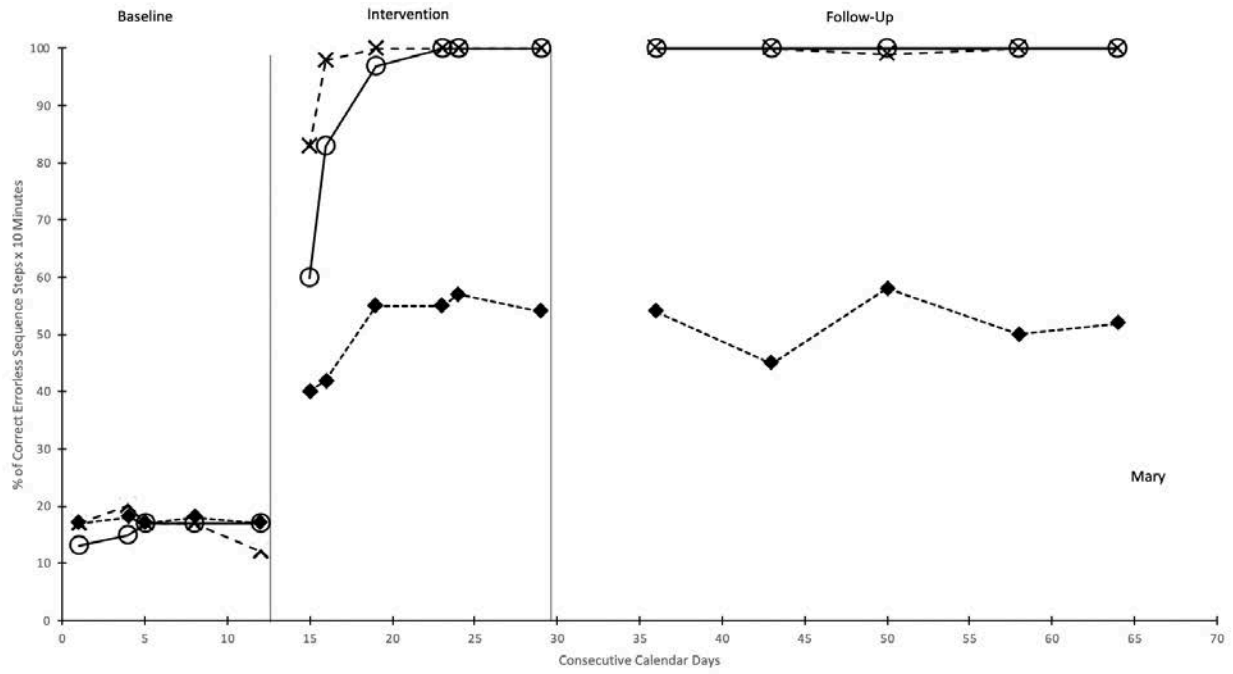

Figure 4. Percentage of correct steps implemented during the 10-minute session by Mary.

Note: *BPF*- Brief Performance Feedback for the errorless sequence of intraverbal; *BST*- Behavioral Skills Training for the errorless sequence of listener responding of actions; Control – Typed instructions for tacts for Mary. ○ = BPF; X = BST; ◆ Control

3.2.3 Caroline

Se Figures 5-6 for Caroline's data across conditions.

3.2.3.1 Baseline.

As in the case of Elizabeth and Mary, the baseline condition for Caroline was conducted for five consecutive observation sessions. Mean number of correctly implemented errorless sequences across target skills was zero. Mean percentage of implementation fidelity, for Caroline, was 14% (i.e., 13% tact; 13% intraverbal; and 16% listener responding).

3.2.3.2 Intervention.

Caroline's results for BPF, BST, and Typed Instructions are described below.

3.2.3.2.1 Brief performance feedback.

The BPF intervention was used to train Caroline to implement the errorless teaching sequence of tact of pictures of common items. Training mastery was reached by Caroline after five BPF intervention sessions. Mean performance during this condition, for Caroline was nine correct errorless sequences when teaching tacts (range 0-12) and 88% correct implementation of the errorless sequence steps. An immediate level change was also observed, from baseline to intervention, after the first presentation of the BPF training intervention (i.e., from 13% to 44% implementation fidelity). However, the change, as in the case of Mary, was gradual and with an increasing trend until mastery was reached.

3.2.3.2.2 BST.

Similarly, BST was implemented with training Caroline to implement the errorless sequence to teach target intraverbal targets. Training criterion was reached after three training sessions for Caroline for the BST training condition and with mean number of correct errorless sequences taught during BST condition of 11correct sequences (range 10-13 correct sequences) and mean implementation fidelity, during BST training, of 100%. Similar to Mary's case, two additional training sessions were provided since Caroline reached training termination two days prior the BPF condition reached termination of training. This procedure was implemented as recommended by the existing literature (Ledford & Gast, 2018). It is important to note that implementation of BST produce an immediate and drastic change in level, from baseline to

intervention, following the first BST session (i.e., from 13% during baseline to 100% after first BST training).

3.2.3.2.3 Typed Instructions.

For Caroline, typed instructions was used to train the implementation of the errorless teaching sequence to teach listener responding targets. As in the case of Elizabeth and Mary, Caroline neither taught a single correct listener responding errorless sequence during the intervention phase of the study (M=0), nor reached optimal levels of implementation fidelity throughout the duration of the training condition (i.e., M= 53%). Though improvements were observed in implementation fidelity after the first delivery of typed instructions, changes were only moderate when compared to the observed effect of BPF and BST on their respective target skills.

3.2.3.3 Follow-Up.

Caroline's results during the follow-up condition across the trainings assessed in this study are described below.

3.2.3.3.1 Brief performance feedback.

During the five follow-up sessions, Caroline taught an average of 11 correct errorless sequences when teaching selected tact targets across the five follow-up sessions, as well as maintained high levels of correct implementation of errorless sequence steps to teach tact targets, with a mean of 100% implementation fidelity during follow-up. No error sequences or steps were observed during the follow-up phase of the study for Caroline.

3.2.3.3.2 BST.

Similarly, Caroline's mean number of correct errorless sequences to teach intraverbal targets was 11. No error sequences were performed. With respect to the percentage of errorless sequence steps correctly implemented, mean implementation fidelity across the five follow-up sessions was 100%.

3.2.3.3.3 Typed instructions.

During the follow the follow-up phase of the present study, Caroline taught zero correct errorless sequences to teach listener responding targets, when using typed instructions as the training strategy. Similarly, as in the case of Elizabeth and Mary, Caroline's implementation fidelity did not reach optimal levels, reaching a mean of 56% implementation fidelity during the follow-up phase (i.e., 50%-63% range).

3.2.3.3.4 Data Summary.

Similarly, in the case of Caroline, a functional relation was demonstrated between BPF, BST, and Typed Instructions. Caroline's performance showed improvements during the intervention condition of the study when trained under BFP and BST, reaching optimal levels of implementation, whereas only moderate level changes were observed for skills trained under Typed instructions. A clear differentiation in correct performance was observed for Caroline for BPF and BST when compared to target skills trained under Typed instructions. Moreover, when comparing BPF and BST, BST was observed to be more effective than BPF in that an initial differentiation in performance between BPF and BST was observed demonstrated by a more drastic initial impact on Caroline's implementation of its respective target skill and reaching training termination within less sessions (i.e., reached mastery in three whereas BPF reached

training termination in five sessions). Subsequently, no differentiation between BPF and BST was observed for Caroline during the intervention condition. During the follow-up phase of the study, performance for skills trained under BPF and BST maintained at optimal levels while target skills trained under Typed Instructions maintained at mid-level for implementation fidelity and at zero level for the number of correct errorless sequences taught.

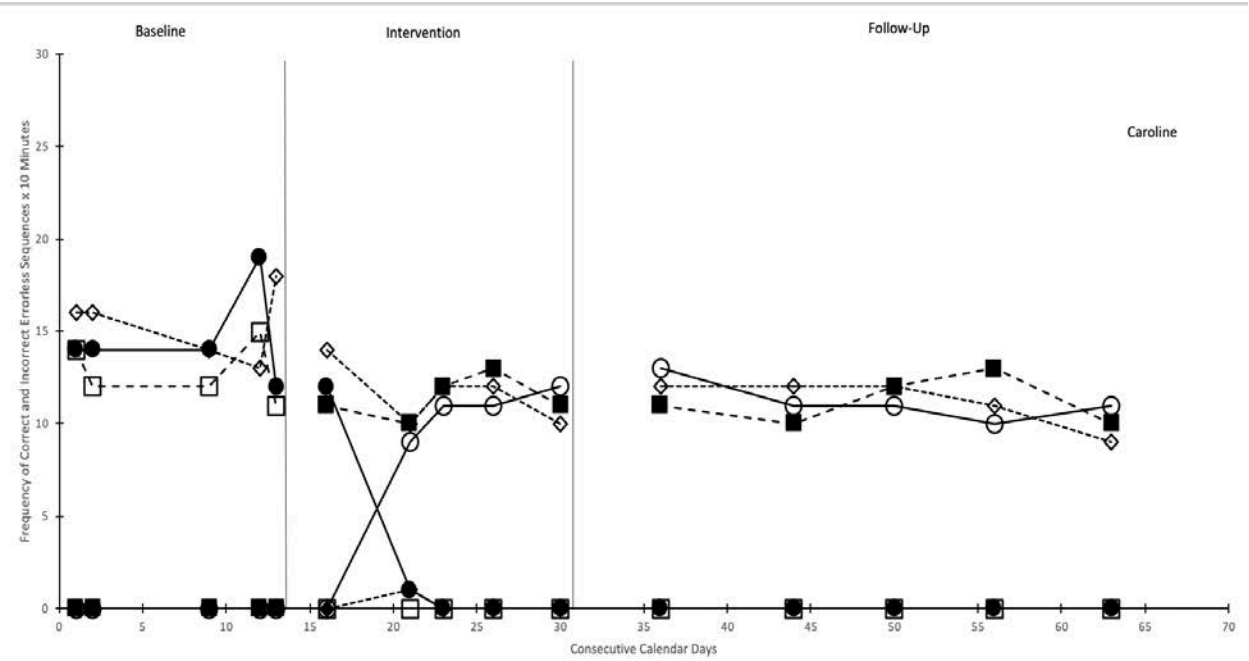

Figure 5. Frequency of correct errorless sequences taught during the 10-minute session by Caroline.

Note: *BPF*- Brief Performance Feedback for errorless sequence for tacts of pictures; *BST*-Behavioral Skill Training for errorless sequence for intraverbal; Control- Typed instructions for errorless sequence for listener responding of actions for Caroline. ○ = correct BFP; ● = incorrect BPF; ■ = correct BST; □ = incorrect BST; ◆ = correct control; ◇ = incorrect control.

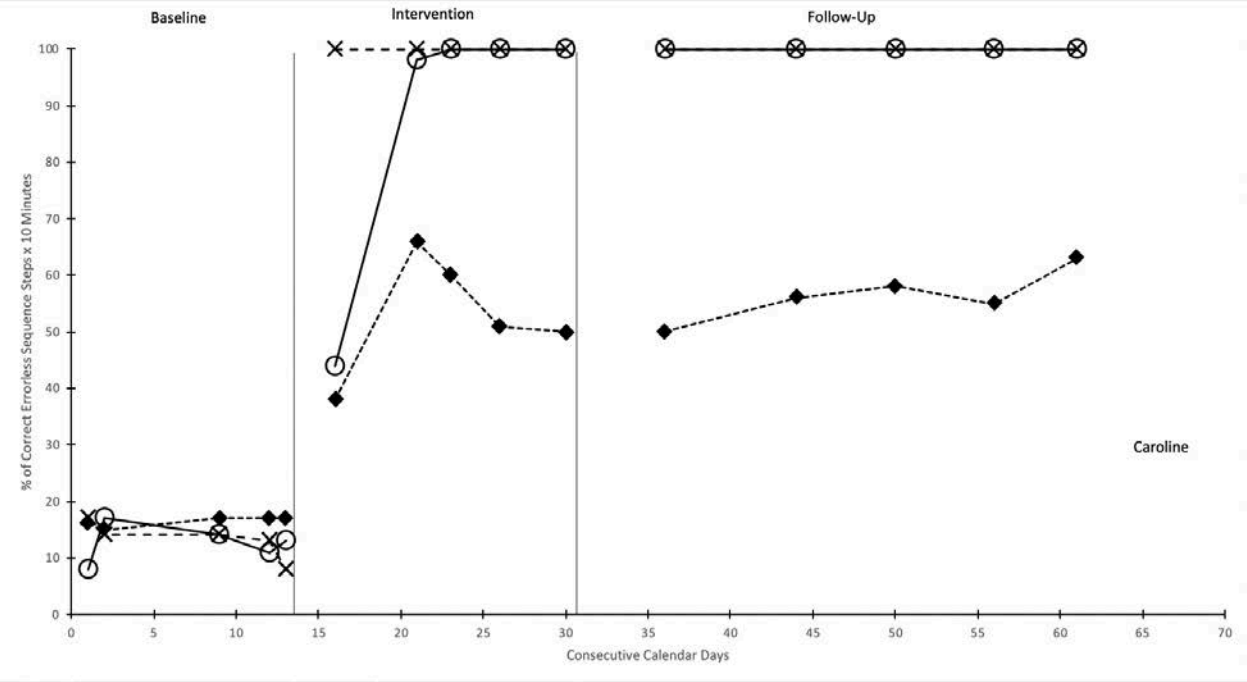

Figure 6. Percentage of correct steps implemented during the 10-minute session for Caroline.

Note: *BPF*- Brief Performance Feedback for errorless sequence for tacts of pictures; *BST*-Behavioral Skill Training for errorless sequence for intraverbal; Control- Typed instructions for errorless sequence for listener responding of actions for Caroline. ○ = BPF; **X** = BST; ◆ = Control

3.2.4 Training Time

Table 6 represents the total training time, in minutes, per strategy employed for the purposes of the present study as well as the mean training time across sessions per paraeducator. Across the three training strategies evaluated in this study, and across the three paraeducator participants, results of evaluation of training time are as follows:

3.2.4.1 Brief performance feedback.

Elizabeth received at total of 14 minutes and 52 seconds of BPF training when trained to implement the errorless teaching sequence to teach listener responding targets to her respective student. Mean BPF session duration for Elizabeth, across training sessions was three minutes and

34 seconds (i.e., 1’43”-5’52” range). Similarly, Mary received a total of 26 minutes and 32 seconds of BFP training to implement the errorless teaching sequences to teach selected intraverbal targets to her respective students. Mean BPF session duration for Mary, across training sessions was four minutes and 36 seconds (i.e., 1’10”-8’33” range). Lastly, Caroline received a total of 17 minutes and six seconds of BPF training to reach mastery criteria when implementing the errorless teaching sequence for selected tact targets for her respective student. Total mean BPF training time for Caroline was three minutes and 24 seconds (i.e., 1’26”-4’06” range). Across participants, mean BPF training time, during the intervention phase of the present study was four minutes and eight seconds (i.e., *M*= 4’08” training time)

3.2.4.2 BST.

BST was employed when training Elizabeth to implement the errorless teaching sequence for selected tact targets. Throughout the intervention phase of the study, Elizabeth required a total of 42 minutes and 43 seconds of BST training prior reaching mastery criteria of the respective target skill (i.e., errorless teaching sequence for tact targets). Mean BST training time for Elizabeth, across training sessions, was 11 minutes (i.e., 8’15”-14’34” range). In the case of Mary, she required, prior reaching training termination, a total of 60 minutes and 49 seconds of BST training to implement the errorless teaching sequence for selected listener responding targets. Across sessions, mean BPF training time for Mary was 12 minutes and eight seconds (i.e., 8’50”-16’59” range). Lastly, Caroline reached BST training termination, when implementing the errorless teaching sequence to teach intraverbal targets, after a total of 51 minutes and ten seconds of BST training time. Mean BST training, across sessions for Caroline was ten minutes and 22 seconds of training time. Mean BST training time across paraeducator participants during the intervention condition of this study was 11 minutes and one second (i.e., *M*= 11’10” training time).

3.2.4.3 Typed instructions.

Typed instructions were used as a control measure for the purposes of this study. Across paraeducator participants, mean typed instructions training time for Elizabeth, across sessions, was two minutes and 28 seconds (i.e., 1'11"-3'36" range); two minutes and three seconds for Mary (i.e., 1'17-2'09" range); and one minute and 49 seconds for Caroline (i.e., 1'16-1'49" range). Overall, total mean typed instructions training time, across participants, during the intervention phase of the study was two minutes and 33 seconds (i.e., *M*= 2'33" training time).

Table 6. Training time

Participant	*Mean Session duration*			*Total training Time*		
	BPF	*BST*	*TI*	*BPF*	*BST*	*TI*
Elizabeth	3' 34"	11' 00"	2'28"	14' 52"	42' 43"	8' 32"
Mary	4' 36"	12' 08"	2' 03"	26' 32"	60' 49"	8' 15"
Caroline	3' 24"	10' 22"	1' 49"	17' 06"	51' 10"	7' 46"

Note: BPF = Brief Performance Feedback; BST = Behavioral Skills Training; TI = Typed Instruction

3.2.5 Social Validity

Participants responses to the AARP (Tarnowski & Simonian, 1992) suggested high levels of acceptability towards BPF and BST as training strategies. Across participants, mean score for BPF was 34.3 (range 33-35 points); mean score for BST was 39.6 (range 35-42 points); and mean score for typed instructions was 26 (range 19-35 points). Similarly, with respect to responses to the experimenter-developed questionnaire, with respect to BPF, feedback provided by all

participants indicated specific, procedure-based PF being very helpful in improving their implementation of the errorless teaching sequence to teach target skills as well as improving the quality of services provided to their respective students. In addition, all paraeducator participants highly appreciated the opportunity to (a) identify specific target behaviors incorrectly performed and (b) practice skills incorrectly performed and receive feedback post implementation. Moreover, all paraeducators indicated this training as not time consuming at teaching them to implement errorless teaching sequences to teach target verbal skills. Conversely regarding the BPF intervention, participants seemed not to enjoy the absence of modeling of target behaviors and/or instructions (i.e., Elizabeth and Mary). Overall, paraeducator participants considered this training as effective at teaching them to implement the behaviors selected for training and rated procedures and/or components of BPF high in acceptability.

With respect to the implementation of BST, as a training strategy evaluated in this study, paraeducator participants reported that the opportunity to practice the skill prior implementation with the student and receiving PF immediately following skill practice with the PI was helpful at improving their use of errorless procedures to teach target verbal skills. Additionally, two participants (i.e., Elizabeth and Mary) reported modeling as a component that they found beneficial as it provided them with what the expectation was when delivering instruction to the student. Moreover, one participant (i.e., Elizabeth) reported finding this training strategy well suited to her individual learning style. It is worth noting that two participants (i.e., Mary and Caroline) indicated concern as to how this training could be delivered in the classroom, in the context of their daily activities, due to the increased time to deliver and the needs of the students they supported. Similarly, all participants reported dislike by not receiving feedback following implementation

with the students. Overall, participants reported BST as effective, most beneficial and rated training procedures and/or components highest in acceptability.

Lastly, paraeducators also completed the questionnaire regarding specific aspects of typed instructions as a training strategy. Participants reported this training as less likely to be effective due to that it did not provide any PF related to their implementation. One participant reported this training "making her anxious" (i.e., Elizabeth) due to not having a clear idea as to what the expectation was. Another aspect two participant did not enjoy in relation to typed instructions as a training strategy was not having the opportunity to ask questions. Moreover, one participant reported this training as "boring" when having to read the same instructions every time prior implementation. Overall, participants considered this training as being of some to low effectiveness and rated training procedures and/or components the lowest in acceptability.

3.3 Discussion

As stipulated by educational law, paraeducators adequately trained may assist in the delivery of special educations services to students with ASD and other disabilities in educational settings (IDEA, 2004). Thus, paraeducators play an essential role in the instruction and/or education of students with ASD. However, their training in actual special education settings or in the special education classroom faces many challenges (Gerencser, Higbee, Contreras, Pellegrino, & Gunn, 2018). Despite existing evidence of effectiveness of multicomponent or comprehensive training approaches for the training of paraeducators supporting students with ASD and/or other intellectual disabilities, implementation of these training approaches may compromise the feasibility of paraeducator training in the actual classroom due to increased required time and

resources (Gormley, Healy, Doherty, O'Regan, & Grey, 2019; Leblanc et al., 2005). Considering the recommendations of the existing literature regarding the need to identify more practical, efficient, but equally effective methods to train paraeducators supporting students with ASD (Gilligan et al., 2007; Leblanc et al., 2005), the present study attempted compare the effectiveness and efficiency of a brief, PF-based intervention (i.e., BPF) to a multicomponent, research based training strategy, (i.e., BST) on the number of correctly implemented errorless teaching sequences, by paraeducators, when training verbal skills (i.e., tact, listener responding, and intraverbal) to students with ASD, as well as the overall percentage of correctly implemented errorless teaching sequence steps implemented by paraeducators during the training of verbal skills to their respective students with ASD. Last, the present also study evaluated paraeducator maintenance of implementation of errorless teaching procedures when teaching target verbal skills to students with ASD, post training termination. It is worth noting that, for the purposes of the present study, a BPF intervention consisting of post-session vocal verbal PF, with a component of skill rehearsal as corrective feedback for target behaviors within errorless sequences not implemented correctly, was developed as suggested by the existing literature (Gilligan et al., 2007; Leblanc et al., 2005). Similarly, a pre-session BST intervention, that consisted of instructions/review, modeling, skill rehearsal, and performance feedback until a predetermined criterion was obtained, prior to implementation with target students, was implemented during this study (Lavie & Sturmey, 2002; Ledford et al., 2017). Last, an intervention that consisted of typed instructions was employed as a control measure for the purposes of this study. Specifically, the present study attempted to answer the following research questions: (1) what is the difference of the effectiveness and efficiency of BPF, BST, and typed instructions with respect to paraprofessionals' frequency of correctly implemented errorless teaching sequences taught to students with ASD? (2) what is the difference

of the effectiveness and efficiency of BPF, BST, and typed instructions with respect to paraprofessionals' percentage of correctly implemented errorless teaching sequence steps? (3) what is the difference in paraprofessionals' maintenance of implementation of errorless teaching procedures to teach tact, listener responding, and intraverbal skills to students with ASD, post-training termination?

This study extended the research base regarding the effectiveness, applicability of abbreviated training strategies (e.g., BPF) during the training of paraeducators supporting students with ASD, and the potential efficiency of these interventions over more comprehensive training approaches (i.e., BST), by demonstrating a functional relation for each participant between the implementation of BPF, showing similar levels of effectiveness when compared to BST and greater effectiveness when compared with Typed Instructions, and improvements on paraeducators implementation of targeted interventions. Moreover, results of present study demonstrated the implementation of BPF requiring less and/or reduced training time to meet optimal levels of implementation when compared to BST and Typed Instructions. Additionally, all participants were able to maintain optimal levels of implementation fidelity post training termination during established follow-up sessions (i.e., once weekly for five consecutive weeks).

3.3.1 Training Effectiveness

The results of the present study, with respect to the effectiveness of the evaluated training interventions, showed that both BPF and BST were more effective than Typed Instructions at increasing the frequency of correct errorless teaching sequences implemented by paraeducator participants, across target verbal skills (i.e., tact, listener responding, and intraverbal). Undifferentiated patterns of performance with respect to the number of correct errorless sequences

taught were observed, across paraeducator participants, for BPF and BST and a clear differentiation in terms of correct number of sequences was demonstrated between BPF, BST and Typed Instructions. During baseline, the frequency of correctly implemented errorless teaching sequences, across participants, was zero (i.e., *M*= 0). Number of error sequences across paraeducator participants, and across target verbal skills, during baseline ranged from 6-22 sequences, and with a total mean of error sequences, across participants of 12.2. sequences (i.e., Elizabeth = 11.2; Mary = 11.4; Caroline = 14.2). During the intervention phase of the study, an evident increase in the frequency of correct sequences taught across target verbal skills, and thus reduction of error sequences, was exhibited across participants after implementation of BPF and BST trainings but not after implementation of Typed Instructions. In general, paraeducators in this study taught, on average, more correct errorless sequences for target verbal skills when trained under BST than when trained under BPF (i.e., *M*= 11.3 for BST; *M*= 9.8 for BPF), whereas no improvements were observed across participants, with respect to the number of correct errorless sequences taught under the Typed Instructions condition (*M*= 0). Similarly, BST appeared to produce a more consistent and greater effect at increasing the frequency of errorless teaching sequences correctly implemented than BPF across participants. After only one BST training session, a moderate (i.e., Elizabeth and Mary) to more drastic (i.e., Caroline) change in level from baseline to intervention was observed across participants, teaching an average of seven correct errorless teaching sequences across target skills (i.e., six, four, and 11, respectively). It was only in the case of Elizabeth in which BPF produced a better effect than BST (i.e., ten correct sequences after only one BPF training). This may suggest the potentially potent effect of BPF at rapidly increasing paraeducator implementation of target skills, considering participants had not prior training or exposure to the implementation of errorless teaching procedures. Similarly, only in the

case of Caroline were changes in the frequency of correctly taught errorless sequences not observed from baseline to implementation following the first BPF training (i.e., zero correct sequences after first BPF session). Analysis of level, trend, and variability, under BPF and BST trainings demonstrated very similar response patterns in that, initial gradual to rapid increases were observed in the performance and number of correct errorless sequence taught, across participants, and then showing stability with low variability until participants reached training termination. The results of this study may not suggest substantial differences regarding the effectiveness of BPF and BST, rather, these results may provide evidence of more potent effects and faster, or larger, changes in instructional behavior resulting from one or fewer presentations of BST or BPF related to target skills trained under each training. Results of this study align with similar findings regarding consistent and rather rapid improvements in paraeducator or staff implementation of targeted interventions when using BST as a training strategy (Hogan, Knez, & Kahng, 2015; Ledford et al., 2017; Lavie & Sturmey, 2002). However, these results also demonstrate the effectiveness and potential potency of the BPF intervention at increasing paraeducators' instructional performance of targeted practices. Although slight differences are demonstrated by the results of this study with respect to the effectiveness of BPF and BST, effectiveness of one training strategy over the other, on paraeducator performance, may not be solely attributed to the powerful nature of the training strategy or multicomponent structure of it, but also by factors related to learning preferences and/or styles and individual differences (Westover & Martin, 2014).

Similarly, the comparison among BPF, BST and Typed instructions clearly showed BFP and BST being more effective than Typed Instructions at improving paraeducators percentage of correct errorless teaching sequences steps implemented across target skills. Paraeducators under BPF and BST trainings showed consistent improvements in implementation fidelity until training

criterion was reached. Conversely, paraeducators under Typed Instructions, only showed moderate improvements; however, not reaching optimal levels of implementation fidelity during the intervention phase of the study (i.e., data stability at mid-level). Differentiated patterns of performance with respect to implementation fidelity were clearly evident when comparing BPF and BST to Type Instructions rather than when comparing BPF and BST only. In addition, more drastic changes in level, from baseline to intervention, were observed during implementation of BST (i.e. 0% to 98% for Elizabeth; 18% to 83% for Mary; 13% to 100% for Caroline), while paraeducators' improvements in implementation fidelity for errorless sequences under BPF training show more gradual improvements until training mastery was reached (e.g., Mary) or additional opportunities for PF and skill rehearsal were provided (e.g., Caroline). It was only in the case of Caroline where a more evident differentiated pattern of performance is evident; however, only after the first implementation of each training. Subsequent implementations of each training (i.e., BPF and BST) made differences in performance almost indistinguishable. For only one paraeducator (i.e., Elizabeth), the effect BPF was greater than BST; however, the comparison of effect between the two trainings was not drastically different. These more observable differences, across participants, between the effectiveness of BST and BPF, with respect to the percentage of errorless teaching sequence steps may be due to the temporal location of the intervention (i.e., pre-session) and its immediacy of effect on paraeducator instructional behavior with respect to specific steps or components in the target behavior chain (Kirkpatrick, Akers, & Rivera, 2019). In essence, less time elapsing between the delivery of the training and the paraeducator instructional performance and having greater impact on instructional behavior. This, in combination with the multicomponent nature of BST (i.e., modeling, skill rehearsal, and repeated feedback opportunities with additional programmed stimuli) may have contributed to

more drastic changes in paraeducator instructional behavior and quicker acquisition of paraeducators' target skills (Alvero et al., 2001; Kirkpatrick et al., 2019). Similarly, and consistent with the findings of previous research, BPF implementation also had an impact on paraeducators' fidelity of implementation of the errorless teaching sequences to teach verbal skills (Alavosius & Sulzer-Azaroff, 1986; Brock et al., 2017; Madzharova et al., 2012; Madzharova et al., 2018). For all paraeducator participants, the intervention effect was evident after first implementation of the BPF training (i.e., 17% to 100% for Elizabeth; 16% to 60% for Mary; 13% to 44% for Caroline). However, the change in paraeducators' instructional behavior, when compared to BST, appeared more gradual. It is important to note that, as opposed to BST, BPF training occurred immediately following paraeducator implementation of procedures, and the evaluation of BPF effect on target instructional behavior occurred during the next observation session, typically after at least 24 hours. This may also suggest the potency of effect of BPF as a training intervention to improve instructional behavior.

3.3.2 Training Efficiency

A comparison of the efficiency of BPF and BST was also examined with respect to the frequency of correctly taught errorless teaching sequences by paraeducator participants in this study. Participants in this study reached training termination after teaching at least ten correct errorless teaching sequences, for their respective target verbal skill, for three consecutive days and with no error sequences (i.e., 100% implementation fidelity). Simply, to reach at least 10 errorless teaching sequences, without errors, during a 10-minute observation session, and across participants, total amount of BPF training time was 42'26", whereas BST required almost double the amount of time BPF training required (i.e., 79'08" total minutes, across sessions and across

participants). In addition, total mean BPF training session duration, across participants in the study, was 4 minutes and eight seconds (*M*= 4'08"), compared to total mean BST training session duration of eleven minutes and eight seconds *(M*= 11'08"). It is important to consider that the delivery of BPF occurred as a consequence of performance (i.e., immediately following the observation session), so that, in order to observe changes in paraeducator instructional behavior as a result of BPF training during the next session, a time gap of hours (if next observation session occurred the following day) or days (if more than 24 hours elapsed) likely occurred, whereas the provision of BST training occurred immediately prior observation of the paraeducator instructional behavior their respective students. These results not only provide evidence of the powerful nature of BPF at establishing new instructional repertoires in paraeducators, but also, they provide additional evidentiary support of the potential efficiency of BPF intervention over other more comprehensive, multicomponent training approaches when training paraeducators supporting students with ASD, as previously suggested in the existing literature (Leblanc et al., 2005; Robinson, 2011; Wood, et al., 2007). In addition, the minimal time commitment required to deliver a training like BPF may likely increase the feasibility of paraeducator training in the actual special education classroom.

When comparing the efficiency of BPF and BST in relation to the percentage of correctly implemented steps of the errorless teaching sequence to teach targeted verbal skills, results of the present study did not show greater differences between BST and BPF. Participants in this study reached optimal levels of implementation fidelity between 1-3 training sessions (100%) and training termination between 3-6 sessions. For two of the participants (i.e., Mary and Caroline) BST training allowed them to reach mastery criteria for their respective skill within fewer sessions than BPF (i.e., three and five BST training sessions, respectively). However, more training time,

per session, was spent in both cases when compared to BPF. Even when two participants reached training termination within less sessions, the difference to reach mastery criteria between BST and BPF appeared rather minimal (within 1-2 additional sessions). These results suggest the advantages of both training strategies with respect to the efficiency of paraeducator training to implement selected practices, with both strategies being effective at reaching optimal levels of implementation fidelity. It is possible that, due to the more drastic and powerful nature of the training strategy, BST may be more beneficial and efficient than BPF in situations in which the training of paraeducators may need to occur within 1-2 training sessions, with more time available in those sessions (Lavie & Sturmey, 2002; Nigro-Bruzzi & Sturmey, 2010), and BPF being more beneficial and efficient than BST in situations where time and resources are more limited but permit more frequent but shorter training sessions. Lastly, considering the current issues faced in special education classrooms (e.g., unbalanced staff to student ratios, time to train, increased responsibilities of special educators, unavailability of support personnel; Gormley et al., 2019), BPF trainings may more likely to increase the feasibility of paraeducator training and performance monitoring in the special education classroom due to the relative simplicity of training procedures and the minimal time commitment required by special educators as trainers (Mason, Schnitz, Wills, Rosenbloom, Kamps, & Bast, 2017; Wood et al., 2007).

3.3.3 Maintenance

The third research question of this study evaluated whether participants were able to maintain optimal levels of implementation of errorless teaching procedures to teach target verbal skills under BPF and/or BST post reaching training termination. Results of the present study demonstrated no differences related to the maintenance of skills trained under BPF or BST post

training termination, and a clear differentiation of sustained effect over the follow-up phase when compared with Typed Instructions. Assessment of skill maintenance for the purposes of the present study occurred once weekly for five consecutive weeks immediately following the termination of both training conditions (i.e., BPF and BST). Across participants, high levels of implementation fidelity were maintained throughout the follow up phase of the study (i.e., 100% BPF skills; 99.9% BST skills). Similarly, no drastic differences were observed across participants regarding the durability of effect of BFP or BST with respect to the frequency of errorless teaching sequences implemented by paraeducator participants in this study. Related to skills trained under BST, paraeducator participants in this study, maintained ranges of correctly implemented errorless sequences across target skills taught (i.e., BST range 10-16 correct errorless sequences in 10-minute session; *M*= 12.5 sequences per session) similar to those observed during the training condition. Similarly, with respect to skills trained under BPF, paraeducators also maintained similar ranges of correctly taught errorless teaching sequences as those observed during the training condition (i.e., BPF range 10-16 correct sequences in 10-minute session; M= 11.6 sequences per session). In fact, a slight increase in the mean of correct sequences taught by paraeducators, for skills related to both trainings, was observed during the follow-up session. This may be explained by factors such as the frequency of opportunity to practice errorless procedures post-training, observation of trained special educators implementing errorless procedures, and/or inadvertent feedback provided by supervising special educators enough to maintain or increase instructional performance (Alvero et al., 2001; Cooper et al., 2020). The high levels of maintenance of implementation of errorless procedures that resulted from the implementation of BPF and BST for their respective target verbal skills, suggests the effectiveness of both interventions at producing durable effects during the training of paraeducators supporting students

with ASD. However, the observed effectiveness of BPF at producing durable results and the potential time efficiency of BPF interventions over BST may be a factor of consideration when selecting training interventions for paraeducators supporting students with ASD in actual special education classrooms (Robinson, 2011; Wood et al., 2007).

3.3.4 Typed Instructions as Control

Typed Instructions alone, as a form of training, was employed as a control condition for the purposes of this study. As suggested by the existing literature (Fallon, Collier-Meek, Kurtz, & DeFouw, 2018) typed instructions did not impact drastically, and in a meaningful manner, paraeducators' implementation of errorless teaching procedures. Specifically, for the purposes of the present study, Typed Instructions, when compared with BPF and BST, did not result in improved implementation outcomes in paraeducator participants, thus proving it as not effective (Fallon et al., 2018). No correct errorless teaching sequences were taught under this type of training and across participants. Paraeducators in the present study were exposed to typed instructions as a training for different target verbal skills Elizabeth – intraverbal; Mary- Tact; Caroline – LR). However, implementation of this type of training did not result in any increases in the number of correct errorless teaching sequences across phases of the study. Despite not having an impact on the frequency of correct errorless sequences implemented, Typed Instructions did have a modest to moderate effect on paraeducator participants implementation fidelity of the errorless teaching sequence (i.e., percentage of steps correctly implemented). For instance, Elizabeth showed an implementation fidelity improvement from baseline to intervention of 26%. Similarly, Mary showed an improvement in implementation fidelity of skills trained under Typed Instructions, from baseline to intervention of 33% and Caroline showed and improvement of 36%. Despite some

improvements in paraeducator implementation fidelity, when compared to BPF and BST in terms of effectiveness and efficiency, implementation of this training strategy did not produce optimal results at improving paraeducator instructional behavior during this study (Han & Weiss, 2005). Therefore, the use of instructions, or other training strategies of didactic nature, warrant further evaluation when attempting to design training interventions for paraeducators that attempt to maximize the effectiveness and efficiency of training.

Research regarding abbreviated approaches to staff training (Gilligan & Luiselli, 2007; Leblanc et al., 2005; Ward-Horner & Sturmey, 2010) have demonstrated that behavior analytic and educational interventions can by learned quickly and maintained over time by non-certified school personnel, as shown by the results of the present study. This study extends this research base by providing further evidence of the effectiveness of brief training approaches to improve paraprofessional implementation of targeted practices. The selection of performance feedback as the primary training strategy during BPF training, for the purposes of this study, was due to the extensive body of literature that supports its effectiveness (Fallon et al, 2018; Kim, Koegel & Koegel, 2017; Koegel, Kim, & Koegel, 20014; Lavie & Sturmey, 2002; Madzharova et al., 2012; Ward-Horner & Sturmey, 2012). In the present study, the use of a PF intervention script during BPF training allowed for the delivery of consistent, procedure-based PF across participants regarding specific procedures of the targeted errorless teaching sequences. The use of the BPF script also allowed for the evaluation of important dimensions of treatment fidelity in attempts to capture implementation comprehensively, to the greatest extent possible (Hagermoser Sanetti & Kratochwill, 2009). Similarly, by the implementation of the feedback intervention script, in the present study, differences in instructional performance, across participants, could not be attributed to qualitative differences in feedback delivery (Alvero et al., 2001) and thus increasing the internal

validity of the present study. Similarly, per guidelines of the use of the AATD (Ledford & Gast, 2018; Sindelar et al., 1985), as the experimental design of choice for the purposes of the present study, an analysis of the equivalence of each of the errorless teaching sequences, across target verbal skills, was conducted. Based on this analysis, differences in instructional behavior or implementation errors of paraeducator implementation of target practices could not be attributed to response effort or specific components of each of the targeted sequences being more difficult that others (Gresham, 1989), and solely be related to training(s) effects.

Additionally, in the present study, the BPF training intervention also included a component of skill rehearsal as a single antecedent strategy programmed in combination with vocal verbal performance feedback. The addition of this component provided participants with opportunities to practice incorrect responses during paraeducators' implementation of errorless teaching sequences. During BPF training, the inclusion of skill rehearsal seemed sufficient and an effective component, programmed in combination with PF, at improving paraeducators implementation of errorless procedures when teaching verbal skills to their respective students with ASD. The effectiveness of skill rehearsal, as a single antecedent strategy has, in combination with PF, supports the findings of Gilligan and colleagues (2007) in that the use of PF and skill rehearsal only were the sufficient and effective components to increase paraeducator fidelity of implementation of discrete trial training procedures. Moreover, the inclusion of skill rehearsal as a component of the BPF training in the present study contributed to an increased acceptability of BPF training procedures. Results of social validity and training acceptability of the present study support this finding. However, it is important to note that components associated with BST training also increased the acceptability of training procedures (i.e., modeling). Furthermore, the inclusion of the skill rehearsal component, for the purposes of this study, during BPF training did not seem

to increase drastically intervention time, thus contributing to the overall effectiveness and efficiency of BPF as a training intervention for paraeducators supporting students with ASD and/or other intellectual disabilities in special education settings.

3.3.5 Limitations

The results of the present study must be interpreted considering the following limitations. First, and a primary limitation of the present study, the present study did not report the effect of the BPF and/or BST trainings on paraprofessional implementation of errorless teaching procedures to student outcomes (i.e., student acquisition of trained tacts, listener responding, and intraverbal skills). Despite positive student outcomes being the ultimate goal when evaluating any intervention, in the present study, the primary intent was to provide an experimental comparison and demonstration of effect of the effectiveness and efficiency of BPF and BST as interventions to train paraprofessionals supporting students with autism and/or other disabilities in special education settings. However, anecdotal reports obtained from the study suggest mastery of skills by students that correlated with paraeducator training on these skills. Regarding this aspect, it is worth noting that skills selected for student acquisition were only trained by paraeducator participants and not by any other member of the instructional team. This may suggest that paraeducator training may have provided benefit to their students in the mastery of skills selected for acquisition.

Similarly, considering that this study was conducted in actual school settings, an additional room to serve as a setting for the purposes of the present study was not always available. Though, data collection and observations of paraeducators' performance with students was made possible in an experimenter-arranged area in the paraeducator-student special education classroom, and

thus control, to the greatest extent possible for potential extraneous factors, this arrangement may not be have been ideal and could have compromised aspects of instructional performance by paraeducators due to the presence of potential extraneous variables (e.g., observer reactivity, noise level, problem behavior of other students).

In addition, due to that the study beginning shortly after the start of the school year, student participants in the study did demonstrate levels of problem behavior enough to compromise the occurrence of observation sessions during early stages of the study. Therefore, additional individual sessions were conducted by the PI, across all paraeducator participants in the study, related to some strategies to reduce the effect of the conditioned motivating operation -reflexive during instructional delivery (e.g., establishing approach behavior, use of valuable reinforcers during instructional delivery, differential reinforcement of cooperative behaviors, mand training, stimulus demand fading; Carbone et al., 2010). It is important to note, however, that no component of this additional training interfered, or was related to the skills selected for paraeducator acquisition for the purposes of the present study.

Another potential limitation of the present study relates to the evidence produced regarding effectiveness of BPF and BST at producing durable, sustained effects. Despite results of the present study indicating both interventions producing sustained effect post-training, this study only evaluated maintained paraeducator performance for up to the following five weeks, and thus not demonstrating long term maintenance of training(s) effect. In addition, despite not evident by results of the present study, paraeducator participants' acquisition of the target skill selected for the purposes of this study may have been influenced by the presentation of multiple trainings during the same instructional day (i.e., multiple treatment interference). While this factor could be associated with paraeducators' performance during the intervention condition of the study, as

mentioned, this effect was not observed nor evidenced by the results of the present study, by appropriate controls being in place that attempted to minimize this threat (i.e., at least 30 minutes, or more, elapsing between training presentations).

3.3.6 Recommendations for Future Research

Considering one of the limitations of the present study, with respect to the outcomes of the present study not linked to student outcomes, future research that evaluates the effectiveness of a training strategy (e.g., BPF) on paraeducator instructional behavior must attempt to formally link the results of the study to outcomes obtained for students in order to best establish practices with evidence that would aid in the acquisition of skills for students with ASD and/or other disabilities (Frantz, Hansen, Erturk, Machalicek, Squires & Raulson, 2019). Similarly, with respect to the use of multiple settings to conduct experimental phases of this study, future research must attempt to establish experimental settings that may be better suited for the evaluation of IVs of similar nature to those in the present study. However, it is worth noting that despite trainings being conducted in different planned settings, the independent variables evaluated (i.e., BPF, BST) produced desired outcomes in instructional behavior in paraeducator participants, thus strengthening the external validity of the present study.

As noted in the limitations of the present study, student participants displayed some levels of problem behavior related to non-cooperative behaviors observed in traditional instructional sessions and reported by special educators that could have compromised the assessment of the training strategies evaluated for the purposes of this study. Therefore, future replications of the present study or studies that attempt to evaluate performance of paraeducators in relation to students' responding may consider including students that display, preferably, low levels of

problem behavior so that the experimental evaluation of selected IVs are not compromised by factors such as intense problem behavior displayed by students. Similarly, considering the evaluation of intervention effect post training was only conducted for five weeks following training termination, future replications of the present study must attempt to explore paraeducator performance post-training over more extended periods of maintenance or follow-up to best determine whether specific training interventions (e.g., BPF; BST) produce lasting effects. Moreover, future replication of the present study must also attempt to identify whether implementation of this specific training (i.e., BPF) results in generalized performances (e.g., implementation of the same procedures across other students, settings, or other instructional skills).

Despite BPF producing notable results at increasing the instructional performance related to both DVs examined in this study, as well demonstrating the potential time efficiency of BPF over BST, this experimental demonstration can only relate to the extent of teaching verbal skills (i.e., tact, listener responding, and intravervbal) errorless teaching procedures. Further demonstrations of the effectiveness and efficiency of BPF, or other abbreviated training method for paraeducators supporting students with ASD, should attempt to evaluate them in the context of more complex behavior chains (e.g., more steps). Similarly, future experimental demonstrations of the effectiveness and efficiency of BPF, or other brief feedback-based training strategy for paraeducators, should attempt to do so with behavior chains that may result in varied responses by students as a result of application of behavioral principles (e.g., behavior management strategies; extinction procedures; Hagermoser Saneti et al., 2007; Madzharova et al., 2018).

In the present study, a component of skill rehearsal was programmed as the only additional antecedent strategy in combination with PF. Results of the present study showed that the combination of skill rehearsal and performance feedback were sufficient to increase paraeducator

instructional behavior related to the implementation of targeted practices (i.e., errorless teaching procedures); in addition to being supported by previous findings in the existing literature (Gilligan et al., 2007). However, the literature has also presented evidence of effectiveness of other antecedent strategies, programmed in combination with PF, when training paraeducators in the implementation of behavioral interventions for students with ASD (Madzharova et al., 2012; Madzharova et al., 2018; Robinson, 2011). Furthermore, the results of the present study may be in disagreement with previous additional findings suggesting other antecedent strategies being more powerful when evaluated in isolation or when combined with PF (i.e., modeling; Ward-Horner & Sturmey, 2012). Based on findings in the available literature, future research should continue to evaluate, in comparative studies, the effectiveness and potential efficiency of different antecedent strategies (e.g., modeling; skill rehearsal) in attempts to identify most effective intervention components to be programmed in combination with PF for the development of powerful and time efficient training interventions for paraeducators supporting students with ASD in special education classrooms).

Last, the implementation PF, as the main behavior change procedure, in BPF training, in the present study, addressed important dimensions of treatment fidelity identified in the existing literature (i.e., adherence, process, treatment differentiation; Collier-Meek et al., 2018; Hagermoser Sanetti & Kratochwill 2009). However, other important dimensions of treatment integrity may not have been addressed by delivery the delivery of PF (e.g., quality or quantity). Therefore, the nature of PF delivered to paraeducators in this study may not reflect aspects of implementation in a comprehensive manner or may have missed other important components of implementation. Future research regarding this aspect must attempt to design feedback intervention, as the main training component to improve paraeducators' instructional behavior,

encompassing important and appropriate dimensions of treatment integrity for the appropriate evaluation of paraeducator performance of targeted practices.

3.3.7 Recommendations for Practice

The current study demonstrated that the implementation of a brief, practical, perhaps less rigorous training approach for staff training (i.e., BPF) produced similar levels of effectiveness in the acquisition and implementation of targeted behaviors in paraeducators supporting students with ASD and/or other intellectual disabilities in special education settings, when compared with more comprehensive, multicomponent training approaches (i.e., BST). In addition, the results of the current study showed that with less total training and less training time within training session (i.e., *M*= 4’08” across participants), optimal levels of implementation fidelity could be reached. Moreover, sustained performance, over time, was demonstrated by the results of this study when paraeducators maintained number of sequences correctly taught and optimal levels of implementation fidelity of the targeted intervention over a five-week period post-training termination. Considering constraints currently experienced by classroom teams in special education settings, and the relatively easy implementation of training procedures related to BPF trainings, it would be important for school administrators and/or leaders to consider this type of training strategies when planning and executing professional development activities and opportunities for paraeducators. Similarly, school administrators must consider the establishment of systems of support, at the district and school level, that employ effective and efficient strategies for the ongoing training of paraeducators on skills and/or procedures that are relevant to the day to day activities in the classroom when supporting students.

Finally, paraeducator training continues to be a problem of practice. Even though effective training approaches have been identified, these trainings fail to be implemented at the classroom level. Considering that students with ASD and/or other intellectual disabilities, in special education settings, require the implementation of highly precise and effective instruction to acquire and maintain behaviors of social significance (Cook et al., 2015), it is critical that educational agencies providing supports to students with ASD adopt effective, efficient, and feasible training models, that focus on relevant classroom level skills, to improve paraeducator instructional behavior and thus maximize learning outcomes for students with ASD in schools.

3.4 Conclusion

The comparison of BPF and BST during the training of paraeducators supporting students with ASD to implement target instructional practices demonstrated similar effectiveness between BPF and BST and increased time efficiency when trained with BPF. All paraeducators acquired target skills and maintained optimal levels of implementation fidelity with less time during training sessions and overall total training time when trained with BPF. The results of this study provide evidence of the effectiveness and efficiency of BPF and add to the paraeducator training research base regarding effective and efficient training approaches. Furthering this line of research is necessary to continue the process of identification and development of effective and efficient strategies that increase the feasibility of paraeducator training in the special education settings to ensure ongoing improvements in paraeducator instructional behavior, and thus contributing to improved outcomes for students with ASD.

Appendix A Literature Review Results

Table 7. Summary of reviewed studies

Study	*Participants*	*Setting*	*Research Design*	*Dependent Variable*	*Independent Variable*	*Additional Strategy*	*Study Outcome*
Alavosius & Sulzer-Azaroff (1986)	Six paraprofessionals (direct care staff)	Residential school for students with intellectual disabilities (infirmary unit)	Multiple baseline design across participants and settings	Percentage of transfers safely performed	Performance Feedback (Vocal verbal + written) Post-session	NA	Positive (gradual changes in level across participants)
Feldman &Matos (2012)	Three paraprofessionals Three students diagnosed with ASD	Three public elementary school classrooms (general ed.)	Multiple baseline design across participants	Percentage correct on fidelity of implementation of PRT procedures	Performance Feedback (Vocal verbal) In-vivo (in-session)	Protocol review	Positive
Gilligan, Luiselli, & Pace (2007)	Three paraprofessionals Three students diagnosed with ASD/PDD-NOS	School for children with developmental disabilities	Multiple baseline design across participants	Percentage of discrete trial skills implemented correctly	Performance Feedback (Vocal verbal) Post-session	Skill rehearsal	Positive

Table 7. (continued)

Study	*Participants*	*Settings*	*Research Design*	*Dependent Variable*	*Independent Variable*	*Additional Strategy*	*Study Outcome*
Hagermoser Sanetti, Luiselli, & Handler (2007)	Two paraprofessionals Two teachers (General/SPED) One student (ID)	Public elementary school classroom	A-B-BC-B-BC Reversal	Percentage of BSP components correctly implemented	Performance Feedback (Vocal verbal + graphical) Post-session	NA	Positive (gradual changes in level across participants)
Leblanc, Ricciardi, & Luiselli (2005)	Three paraprofessionals Three students (ASD)	Private school for children with developmental disabilities	Multiple baseline design across participants	Percentage of discrete trial skills implemented correctly	Performance Feedback (vocal verbal) Post-session.	Instructions review	Positive
Madzharova, Sturmey, & Jones (2012)	One paraprofessional Two students (ASD)	Applied behavior analysis for children with ASD (cafeteria 6x4/meeting room 4x2)	AB	Percentage of correctly implemented steps to teach peer-to-peer mands	Performance Feedback (vocal verbal) Post-session	Modeling (video)	Positive

Table 7 (continued)

Study	*Participants*	*Setting*	*Research Design*	*Dependent Variable*	*Independent Variable*	*Additional Strategy*	*Study Outcome*
Madzharova, Sturmey, & Yu (2018)	One paraprofessional One teacher/One SLP One student (ASD)	Public elementary school – special education classroom	Non-concurrent multiple baseline design across participants	Percentage of BIP steps correctly implemented	Performance feedback (vocal verbal) Post-session	Modeling (In-vivo)	Positive
Robinson (2011)	Four paraprofessionals Four students (ASD)	Inclusive school setting/natural environments	Multiple baseline design across participants	Percentage of PRT steps correctly implemented	Video-based performance feedback (vocal verbal) Post-session	Modeling	Positive
Scheeler, Morano, & Lee (2018)	Four paraprofessionals Nine students (ASD)	Kindergarten Special education classroom Public middle school autism support classroom	Multiple baseline across participants	Percentage of specific praise statements delivered Rate of specific praise statements delivered	Performance feedback (vocal verbal through Bug-in-ear technology) In-session	Rehearsal (role play)	Positive

Appendix B Study Datasheets

Errorless teaching TACT Checklist

Date: _____ **Participant** _____ **Number steps correct**_____ **% correct**_____ **Targets available (5)? YES NO**

Observer 1: _____**Observer 2:** _____ **IOA%** _____ **BL/INT** **INT time** _____

Number of Tact Sequences Correctly Taught:

Tact Sequence Steps	1st Trial		2nd Trial		3rd Trial		4th Trial		5th Trial		6th Trial		7th Trial		8th Trial		9th Trial		10th Trial		Overall # per Step
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
1. The paraeducator presents non-verbal SD (picture) + instruction "What is it?"																					
2. The paraeducator presents a 0-second delay prompt (echoic/sign)																					
3. The paraeducator re-states the non-verbal SD (picture) + instruction "what is it?" (contingent upon student's response) with NO prompt																					
4. The paraeducator presents 2 easy of mastered trials from student's pile of mastered skills																					
5. The paraeducator re-states non-verbal SD + instruction "what is it?" – with NO prompt (contingent upon student's response on easy trials)																					
6. The paraeducator delivers the preferred item contingent upon correct response – within 3 seconds of correct response																					
# of steps implemented correctly	/6		/6		/6		/6		/6		/6		/6		/6		/6		/6		

NOTE: ***** TEACH AS MANY AS YOU CAN DURING THE 10 MINUTES OBSERVATION SESSION**

Targets taught : _____ ; _____ ; _____; _____; _____

Figure 7. Tact targets errorless teaching sequence datasheet

Errorless teaching LR action Checklist

Date: _____ Participant _____ Number steps correct_____ % correct_____ Targets available (5)? YES NO

Observer 1: _____Observer 2: _____ IOA% _____ BL/INT INT time _____

Number of LR action Sequences Correctly Taught:

Tact Sequence Steps	1st Trial		2nd Trial		3rd Trial		4th Trial		5th Trial		6th Trial		7th Trial		8th Trial		9th Trial		10th Trial		Overall # per Step
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
1. The paraeducator presents the vocal verbal SD (e.g., touch…)																					
2. The paraeducator presents a 0-second delay prompt (i.e., imitative)																					
3. The paraeducator re-states the vocal verbal SD (e.g., touch…) with NO prompt, contingent upon student's response																					
4. The paraeducator presents 2 easy of mastered trials from student's pile of mastered skills																					
5. The paraeducator re-states verbal SD (e.g., touch….) – with NO prompt, contingent upon student's response on easy trials																					
6. The paraeducator delivers the preferred item contingent upon correct response – within 3 seconds of correct response																					
# of steps implemented correctly	/6		/6		/6		/6		/6		/6		/6		/6		/6		/6		

NOTE: ***** TEACH AS MANY AS YOU CAN DURING THE 10 MINUTES OBSERVATION SESSION**

Targets taught : _____ ; _____ ; _____; _____; _____

Figure 8. Listener responding targets erroless teaching sequence datasheet

Errorless teaching Intraverbal Checklist

Date: _____ Participant _____ Number steps correct_____ % correct_____ Targets available (5)? YES NO

Observer 1: _____Observer 2: _____ IOA% _____ BL/INT INT time _____

Number of Intraverbal Sequences Correctly Taught:

Tact Sequence Steps	1st Trial		2nd Trial		3rd Trial		4th Trial		5th Trial		6th Trial		7th Trial		8th Trial		9th Trial		10th Trial		Overall # per Step
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
1. The paraeducator presents the vocal verbal SD (e.g., tell me something you eat?)																					
2. The paraeducator presents a 0-second delay prompt (i.e., tact)																					
3. The paraeducator re-states the vocal verbal SD (e.g., tell me something you eat?) with NO prompt, contingent upon student's response																					
4. The paraeducator presents 2 easy of mastered trials from student's pile of mastered skills																					
5. The paraeducator re-states verbal SD (e.g., tell me something you eat?) – with NO prompt, contingent upon student's response on easy trials																					
6. The paraeducator delivers the preferred item contingent upon correct response – within 3 seconds of correct response																					
# of steps implemented correctly	/6		/6		/6		/6		/6		/6		/6		/6		/6		/6		

NOTE: ***** TEACH AS MANY AS YOU CAN DURING THE 10 MINUTES OBSERVATION SESSION**

Targets taught : _____ ; _____ ; _____; _____; _____

Figure 9. Intraverbal targets errorless teaching sequence datasheet

Appendix C Intervention Materials

Step	Correct Performance	Incorrect Performance
1. Presents non-verbal SD (picture + instruction "what is it?"	**It was really good the way that you presented the non-verbal SD and the instruction "what is it" (evaluative).** You kept the picture at eye level while presenting the picture card and pointed to the picture card while presenting the verbal instruction "what is it?" (descriptive)	**The non-verbal SD (picture) and the instruction "what is it?" was not presented correctly (evaluative).** Remember that once selected the target to teach. Present the picture at eye level, then point to it and ask the question "what is it?". You must continue pointing to the picture until the question "what is it?" has been delivered (descriptive) Let's practice this step….
2. Presents 0-second delay prompt (i.e., echoic or imitative)	**You did a great job presenting the echoic (or imitative prompt for signer) immediately following presentation of the picture (non-verbal SD) and question "what is it?" (evaluative).** Immediately following presentation of the picture and asking the question "what is it?" you said the name of the picture for the student to echo what you said (descriptive).	**The echoic (or imitative in case of signer) prompt was not presented immediately following presentation of the picture and question "what is it?" (evaluative).** Remember as immediately (within one second) following the presentation of the picture and the question what is it? you must say (or sign) the name of the picture (descriptive). Let's practice this step…
3. Re-state non-verbal SD + instruction "what is it?" with NO prompt and contingent upon correct response on prompted trial	**You did excellent re-presenting the picture along with the question "what is it?" with no prompt following the student correct response on correct trial (evaluative).** You represented the picture at eye level and pointed to the picture and asked the question "what is it?" following this step you did not say the word, so the prompt was faded (descriptive)	**The picture + question what is it? was not re-stated/were not re-stated correctly or immediately following the student's correct response on the prompted trial (previous step; evaluative).** Remember that following the students echoing what you said on the prompted trial then you must re-present the picture at eye level, point to the picture, and while pointing ask the question "what is it?". In this step you are to provide any assistance (descriptive). Let's practice this step…
4. Presents 2 easy or mastered trials from the student's pile of mastered skills	**You did very well with the presentation of 2 easy of mastered trials following student's correct responding on the previous step (evaluative**). Once correct responding of the student on the previous step, you selected one skill for the pile of mastered skills. Once the student correctly responded to the first easy trial presented, then you presented the second easy trial from the student's pile of easy skills (cards; descriptive).	**The presentation of easy trials following student's correct responding on the previous steps was not correctly performed (evaluative).** Remember that following the student's response on the previous step, you must select a trial from the student's pile of easy skills. Then, immediately (within 1-2 seconds) following correct responding on easy trial, you will present a second trial to the student. Remember that all easy trials presented must come from the student's pile of easy or mastered skills (descriptive). Let's practice this step…
5. Re-state non-verbal SD + instruction "what is it?" with no prompt and contingent upon correct response on easy trials	**Great job!! re-presenting the picture and the question "what is it?" following correct performance on the easy trials. You did great not presenting any prompting or assistance to the student (evaluative).** You presented the picture at eye level to the student, pointed to the picture and while pointing you asked the question "what is it?". You refrain from saying the name of the picture (descriptive).	**The picture and/or question "what is it?" were not correctly re-stated following student's correct responding on easy trials (evaluative).** Remember that following correct student's performance on easy trials, you must re-present the picture at eye level, point to the picture, and while pointing to the picture ask the question "What is it?". Remember that during this step you do not want to say the name of the picture (descriptive). Let's practice this step…
6. Delivers the preferred item/reinforcer to the student	**You did really well delivering the preferred item or reinforcer following the student's correct response on the target tact (evaluative).** Immediately following the student's response on the target tact, you praised the student for correct responding and delivered the preferred item or reinforcer. This was done within one second or student's correct response (descriptive)	**The preferred item/reinforcer was not delivered (or not delivered correctly) following student's correct response on the target tact (evaluative).** Remember that you need to deliver the preferred item/reinforcer following correct student's performance on the target tact. You can do this by immediately (within 1-3 seconds) following correct responding, provide praise (e.g., great labeling cookie) and delivering the preferred item (descriptive). Let's practice this step…

Figure 10. Brief performance feedback script for tacts

Step	Correct Performance	Incorrect Performance
1. Presents verbal SD or instruction (e.g., touch nose)	**It was really good the way that you presented verbal SD or direction (e.g., touch nose; evaluative).** You clearly delivered the verbal instruction or direction to the student. You did not provide any form of assistance (descriptive).	**The verbal SD or verbal direction was not presented correctly (evaluative).** Remember that once selected the target to teach. Clearly present verbally the instruction or direction to complete by the student. This must NOT be accompanied by any form of assistance (descriptive). Let's rehearse this step…
2. Presents 0-second delay prompt (i.e., imitative)	**You did a great job presenting the imitative prompt immediately following presentation of the verbal SD (evaluative).** Immediately following presentation of the verbal direction (e.g., touch nose) you provide an imitative prompt by modeling the movement to be performed (descriptive)	**The imitative prompt was not presented immediately following the verbal SD or direction (evaluative)** Remember as immediately (within one second) following the presentation of the verbal direction (SD) you want to present the imitative prompt. This is done by modeling the movement associated with the direction (descriptive). Let's practice this step…
3. Re-state verbal SD (e.g., touch nose) with NO prompt and contingent upon correct response on prompted trial	**You did excellent re-presenting verbally and clearly the target direction (e.g., touch nose) with NO assistance of any kind (evaluative).** You represented verbally the target instruction and did not provide any form of assistance. This allowed for the prompt to be faded completely (descriptive)	**The verbal SD or direction (e.g., touch nose) was not correctly presented/OR without prompts.** Remember that following the student imitating the correct movement, you want to verbally and clearly re-state the direction (e.g., touch nose). At this point no form of assistance is provided (descriptive). Let's rehearse this step…
4. Presents 2 easy or mastered trials from the student's pile of mastered skills	**You did very well with the presentation of 2 easy of mastered trials following student's correct responding on the previous step (evaluative**). Once correct responding of the student on the previous step, you selected one skill for the pile of mastered skills. Once the student correctly responded to the first easy trial presented, then you presented the second easy trial from the student's pile of easy skills (cards; descriptive).	**The presentation of easy trials following student's correct responding on the previous steps was not correctly performed (evaluative).** Remember that following the student's response on the previous step, you must select a trial from the student's pile of easy skills. Then, immediately (within 1-2 seconds) following correct responding on easy trial, you will present a second trial to the student. Remember that all easy trials presented must come from the student's pile of easy or mastered skills (descriptive). Let's practice this step…
5. Re-state verbal SD/instruction (e.g., touch nose) with no prompt and contingent upon correct response on easy trials	**Great job!! re-presenting verbally the direction to be performed following correct performance on the easy trials. You did great not presenting any prompting or assistance to the student (evaluative).** You presented verbally the instruction or directive very clearly. You refrained from providing any form of assistance or modeling at this point (descriptive).	**The verbal instruction or directive (SD) was not correctly/clearly presented OR without presentation of any assistance (evaluative).** Remember that following correct student's performance on easy trials, you must re-state verbally the direction (SD; e.g., touch nose). Remember that during this step you do not want to model the movement associated with the direction presented (descriptive). Let's practice this step…
6. Delivers the preferred item/reinforcer to the student	**You did really well delivering the preferred item or reinforcer following the student's correct response on the target tact (evaluative).** Immediately following the student's response on the target tact, you praised the student for correct responding and delivered the preferred item or reinforcer. This was done within one second or student's correct response (descriptive)	**The preferred item/reinforcer was not delivered (or not delivered correctly) following student's correct response on the target tact (evaluative).** Remember that you need to deliver the preferred item/reinforcer following correct student's performance on the target tact. You can do this by immediately (within 1-3 seconds) following correct responding, provide praise (e.g., great labeling cookie) and delivering the preferred item (descriptive). Let's practice this step…

Figure 11. Brief performance feedback script for listener responding

Step	Correct Performance	Incorrect Performance
1. Presents verbal SD (e.g., tell me something you eat)	**It was really good the way that you presented verbal SD (e.g., tell me something you eat; evaluative).** You clearly delivered the verbal instruction student. You did not provide any form of assistance (descriptive).	**The verbal SD was not presented correctly (evaluative).** Remember that once selected the target to teach, clearly present verbally the instruction or SD to the student. This must NOT be accompanied by any form of assistance (descriptive). Let's rehearse this step…
2. Presents 0-second delay prompt (i.e., imitative)	**You did a great job presenting the tact prompt immediately following presentation of the verbal SD (evaluative).** Immediately following presentation of the verbal direction (e.g., tell me something you eat) you provide the corresponding tact prompt by presenting the picture of the target item (descriptive)	**The tact prompt was not presented immediately following the verbal SD or direction (evaluative)** Remember as immediately (within one second) following the presentation of the verbal direction (SD) you want to present the tact prompt. This is done by presenting the picture of the target item immediately following the SD (descriptive). Let's practice this step…
3. Re-state verbal SD (e.g., touch nose) with NO prompt and contingent upon correct response on prompted trial	**You did excellent re-presenting verbally and clearly the target SD (e.g., tell me something you eat) with NO assistance of any kind (evaluative).** You represented verbally the target SD and did not provide any form of assistance. This allowed for the prompt to be faded completely (descriptive)	**The verbal SD (e.g., tell me something you eat) was not correctly presented/OR without prompts.** Remember that following the student responding to the tact prompt in the previous step, you want to verbally and clearly re-state the SD (e.g., tell me something you eat). At this point no form of assistance is provided or picture is presented (descriptive). Let's rehearse this step…
4. Presents 2 easy or mastered trials from the student's pile of mastered skills	**You did very well with the presentation of 2 easy of mastered trials following student's correct responding on the previous step (evaluative**). Once correct responding of the student on the previous step, you selected one skill for the pile of mastered skills. Once the student correctly responded to the first easy trial presented, then you presented the second easy trial from the student's pile of easy skills (cards; descriptive).	**The presentation of easy trials following student's correct responding on the previous steps was not correctly performed (evaluative).** Remember that following the student's response on the previous step, you must select a trial from the student's pile of easy skills. Then, immediately (within 1-2 seconds) following correct responding on easy trial, you will present a second trial to the student. Remember that all easy trials presented must come from the student's pile of easy or mastered skills (descriptive). Let's practice this step…
5. Re-state verbal SD/instruction (e.g., touch nose) with no prompt and contingent upon correct response on easy trials	**Great job!! re-presenting the verbal SD (e.g., tell me something you eat) following correct performance on the easy trials. You did great not presenting any prompting or assistance to the student (evaluative).** Following correct performance on easy trials, you presented very clearly the verbal SD (e.g., tell me something you eat). You refrained from providing any form of assistance or picture as a form of prompt at this point (descriptive).	**The verbal SD was not correctly/clearly presented OR without presentation of any assistance (evaluative).** Remember that following correct student's performance on easy trials, you must re-state the verbal SD; e.g., tell me something you eat). Remember that during this step you do not want to present a picture as a tact prompt or any other form of assistance (descriptive). Let's practice this step…
6. Delivers the preferred item/reinforcer to the student	**You did really well delivering the preferred item or reinforcer following the student's correct response on the target tact (evaluative).** Immediately following the student's response on the target tact, you praised the student for correct responding and delivered the preferred item or reinforcer. This was done within one second or student's correct response (descriptive)	**The preferred item/reinforcer was not delivered (or not delivered correctly) following student's correct response on the target tact (evaluative).** Remember that you need to deliver the preferred item/reinforcer following correct student's performance on the target tact. You can do this by immediately (within 1-3 seconds) following correct responding, provide praise (e.g., great labeling cookie) and delivering the preferred item (descriptive). Let's practice this step…

Figure 12. Brief performance feedback script for intraverbals

Errorless Teaching Instructions - TACT PICTURES

Tact = LABELING

Tact – Verbal behavior

Sensory antecedent (e.g., seeing, hearing, smelling, feeling)
Verbal behavior - labeling (speaking or signing)
Generalized social reinforcement (social praise/something good happens).

1.	**Presents non-verbal SD (picture) + instruction "what is it?"** *This step in the sequences involves the instructor selecting the first target to teach. Then the instructor will show the picture the student (at eye level), point to the target picture, and ask the question "What is it?" immediately following pointing to the picture. The instructor will continue pointing to the picture until he/she has asked the question "what is it?"*
2.	**Presents 0-second delay prompt (i.e., echoic or imitative)** *Immediately following presentation of the non-verbal SD (picture) + instruction "what is it?", the instructor will provide an immediate echoic or imitative prompt (assistance). An echoic prompt will occur when, immediately following presentation of the picture and the instruction "What is it?" the instructor will SAY the name of the item on the picture. This prompt is used when the student uses vocal verbal behavior to communicate (i.e., talking). An imitative prompt will occur when, immediately following presentation of the picture and the instruction "what is it?", the instructor will MODEL the sign associated with the item of the picture. This prompt is used when the student uses sign language to communicate or when does not have the ability to produce intelligible speech (i.e., does not talk or talking is not easily understood)*
3.	**Re-state non-verbal SD + instruction "what is it?" with NO prompt and contingent upon correct response on prompted trial** *Immediately following student's response on the prompted trial, the instructor will re-present the target picture at eye level, point to the target picture, and ask the question "what is it? immediately following pointing to the picture. The instructor will continue pointing to the picture until she/she has asked the question "what is it?". It is important to note that following the presentation of the picture and the instruction "what is it? NO PROMPT WILL BE PROVIDED (saying the word or modeling the sign)*
4.	**Presents 2 easy or mastered trials from the student's pile of mastered skills** *This step involves, following correct responding of the previous step (the student saying/signing the name of the item on the target picture), the instructor will present a new trial from the pile of mastered skills. To do this, the instructor will pick up a card from the pile and present the instruction to the student (e.g., say I live in Pittsburgh; touch your nose). Following correct responding on this trial, the instructor will proceed to present another trial to the student by selecting the following skill and presenting the instruction to the student (e.g. clap hands; what is it? while showing picture of dog? – NO PROMPTS WILL BE PROVIDED WHILE PRESENTING EASY OR MASTERED TRIALS*
5.	**Re-state non-verbal SD + instruction "What is it?" with NO prompt and contingent upon correct response on easy trials** *Immediately following student's response on the prompted trial, the instructor will re-present the target picture at eye level, point to the target picture, and ask the question "what is it? immediately following pointing to the picture. The instructor will continue pointing to the picture until she/she has asked the question "what is it?". It is important to note that following the presentation of the picture and the instruction "what is it? NO PROMPT WILL BE PROVIDED (saying the word or modeling the sign*
6.	**Delivers the preferred item/reinforcer to the student** *This step involves the instructor delivering the identified preferred item to the student within 3 seconds of the student responding correctly to the previous step. This is done by the instructor giving social praise to the student (e.g., nice job! labeling ball) and delivering the preferred item to the student.*

Figure 13. Typed instructions for tacts

Errorless Teaching Instructions – LR ACTIONS

Listener Responding = FOLLOWING DIRECTIONS/COMMANDS

LR – Non-verbal behavior
Verbal antecedent (e.g., touch your nose)
Behavior – DOING the behavior (e.g., touching your nose)
Generalized social reinforcement (social praise/something good happens).

	1. Presents vocal verbal SD (e.g., touch nose) *This step in the sequences involves the instructor selecting the first target to teach. Then the instructor will verbally say the instruction to the student (e.g., touch your nose)*
	2. Presents 0-second delay prompt (i.e., imitative) *Immediately following presentation of the verbal SD (e.g. touch your nose), the instructor will provide an immediate imitative prompt (assistance) by modeling the target action to perform (e.g., instructor will model touching his/her own nose). This prompt will be provided IMMEDIATELY following presentation of the instruction and NOT at the same time (saying touch your nose and modeling it immediately after it was said).*
	3. Re-state verbal SD (e.g., touch nose) with NO prompt and contingent upon correct response on prompted trial *Immediately following student's response on the prompted trial, the instructor will re-present the verbal SD (e.g., touch nose). It is important to note that following the presentation of the direction (e.g., touch nose) NO PROMPT WILL BE PROVIDED (e.g., modeling the movement of touching nose).*
	4. Presents 2 easy or mastered trials from the student's pile of mastered skills *This step involves, following correct responding of the previous step (the student saying/signing the name of the item on the target picture), the instructor will present a new trial from the pile of mastered skills. To do this, the instructor will pick up a card from the pile and present the instruction to the student (e.g., say I live in Pittsburgh; touch your nose). Following correct responding on this trial, the instructor will proceed to present another trial to the student by selecting the following skill and presenting the instruction to the student (e.g. clap hands; what is it? while showing picture of dog? – NO PROMPTS WILL BE PROVIDED WHILE PRESENTING EASY OR MASTERED TRIALS*
	5. Re-state verbal SD (e.g., touch nose) with NO prompt and contingent upon correct response on easy trials *Immediately following student's response on the prompted trial, the instructor will re-present the verbal SD (e.g., direction touch nose). It is important to note that following the presentation of the direction (e.g., touch nose) NO PROMPT WILL BE PROVIDED (e.g., modeling touching nose).*
	6. Delivers the preferred item/reinforcer to the student *This step involves the instructor delivering the identified preferred item to the student within 3 seconds of the student responding correctly to the previous step. This is done by the instructor giving social praise to the student (e.g., nice job! touching nose) and delivering the preferred item to the student.*

NOTE: **TEACH AS MANY AS YOU CAN DURING THE 10 MINUTE SESSION OBSERVATION (this may involve teaching a target multiple times during the observation session)**

Figure 14. Typed instructions for listener responding

Errorless Teaching Instructions – INTRAVERBAL

INTRAVERBAL = ANSWERING QUESTIONS/FILLIN-IN RESPONSES/COVERSATIONAL SKILLS

INTRAVERBAL – Verbal behavior
Verbal antecedent (e.g., tell me what you eat?)
Behavior – Answer (e.g., say or sign "cookies")
Generalized social reinforcement (social praise/something good happens).

	1. Presents verbal SD (e.g., tell me something you eat) *This step in the sequences involves the instructor selecting the first target to teach. Then the instructor will verbally say SD to the student (e.g., tell me something you eat)*
	2. Presents 0-second delay prompt (i.e., tact) *Immediately following presentation of the verbal SD (e.g. tell me something you eat), the instructor will provide an immediate tact prompt (assistance) by showing the picture of the correct response (e.g., cookies). The tact prompt will be located in the back of the 3x5 target index card. The instruction will NOT SAY the work cookie while prompting the student with the picture. This prompt will be provided IMMEDIATELY following presentation of the SD and NOT at the same time (asking question and showing tact prompt simultaneously).*
	3. Re-state verbal SD (e.g., tell me what you eat) with NO prompt and contingent upon correct response on prompted trial *Immediately following student's response on the prompted trial, the instructor will re-present the verbal SD (e.g., tell me something you eat). It is important to note that following the presentation of the verbal SD/question (e.g., tell me something you eat) NO PROMPT WILL BE PROVIDED (e.g., tact prompt/verbally saying the answer, or signing the answer).*
	4. Presents 2 easy or mastered trials from the student's pile of mastered skills *This step involves, following correct responding of the previous step (the student saying/signing the name of the item on the target picture), the instructor will present a new trial from the pile of mastered skills. To do this, the instructor will pick up a card from the pile and present the instruction to the student (e.g., say I live in Pittsburgh; touch your nose). Following correct responding on this trial, the instructor will proceed to present another trial to the student by selecting the following skill and presenting the instruction to the student (e.g. clap hands; what is it? while showing picture of dog? – NO PROMPTS WILL BE PROVIDED WHILE PRESENTING EASY OR MASTERED TRIALS*
	5. Re-state verbal SD (e.g., tell me what you eat) with NO prompt and contingent upon correct response on easy trials *Immediately following student's response on the prompted trial, the instructor will re-present the verbal SD (e.g., tell me something you eat). It is important to note that following the presentation of the verbal SD/question (e.g., tell me something you eat) NO PROMPT WILL BE PROVIDED (e.g., tact prompt, verbally saying the answer, or signing the answer).*
	6. Delivers the preferred item/reinforcer to the student *This step involves the instructor delivering the identified preferred item to the student within 3 seconds of the student responding correctly to the previous step. This is done by the instructor giving social praise to the student (e.g., nice job! touching nose) and delivering the preferred item to the student.*

NOTE: **TEACH AS MANY TARGETS AS YOU CAN DURING THE 10 MINUTE SESSION OBSERVATION (this may involve teaching a target multiple times during the observation session)**

Figure 15. Typed instuctions for intraverbals

Appendix D Treatment Fidelity

Treatment Fidelity for Baseline/Follow-up Procedures

Date: _____ Trainer/Researcher: _____ Participant_____

Independent Observer 1: _____Independent Observer 2 _____ IOA% _____

	YES	NO	N/A
1. The trainer provided the participant with the selected training targets, instructed the participant to begin the teaching session by saying "begin the Tact/LR/Intraverbal session – and started the timer for 10 minutes.			
2. The trainer instructed the participant to "teach as many targets as he/she can" during the 10-minute training session			
3. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 1 (Present SD) of the errorless sequence (tact/LR/Intraverbal) OR provided corrective verbal feedback by providing clarification when step 1 (present SD) not performed correctly 3a. The trainer did NOT provide an opportunity to rehearse step 1 if incorrectly performed			
4. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 2 (prompt presentation) of the errorless sequence (tact/LR/Intraverbal) OR provided corrective verbal feedback by providing clarification when step 2 (prompt presentation) not performed correctly 4a. The trainer did NOT provide an opportunity to rehearse step 2 if incorrectly performed			
5. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 3 (prompt fade trial) of the errorless sequence (tact/LR/intraverbal) OR provided corrective verbal feedback by providing clarification when step 3 (prompt fade trial) not performed correctly 5a. The trainer did NOT provide an opportunity to rehearse step 3 if incorrectly performed			
6. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 4 (distract trials) of the errorless sequence (Tact/LR/Intraverbal) OR provided corrective verbal feedback by providing clarification when step 4 (distract trials) not performed correctly 6a. The trainer did NOT provide an opportunity to rehearse step 4 if incorrectly performed			
7. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 5 (re-state SD/no prompt/CHECK) of the errorless sequence (tact/LR/Intraverbal) OR provided corrective verbal feedback by providing clarification when step 5 (re-state SD/no prompt/CHECK) not performed correctly 7a. The trainer did NOT provide an opportunity to rehearse step 5 if incorrectly performed 8. The trainer did **NOT** utilize behavior specific praise when the participant implemented correctly step 6 (delivery of reinforcement) of the errorless sequence (tact/LR/Intraverbal) OR provided corrective verbal feedback by providing clarification when step 6 (delivery of reinforcement) not performed correctly? 8a. The trainer did NOT provide an opportunity to rehearse step 6 if incorrectly performed			
9. The trainer discontinued the session when the timer signaled the end of the established 10 minutes			
10. The trainer did **NOT** answer any questions generated by the participant before, during, or after the session			
Notes:	____ / 10 Percentage of Y's:		

Figure 16. Treatment fidelity checklist for baseline and follow-up conditions

Brief Performance Feedback Implementation Fidelity Checklist

Date: _____ Trainer/Researcher: _____ Participant: _____

Independent Observer 1: _____Independent Observer 2 _____ IOA% _____

	YES	NO	N/A
1. The trainer conducts the observation for 10 minutes			
2. The trainer utilized behavior specific praise when the participant implemented correctly step 1 (Sd presentation) of the errorless sequence OR provided corrective verbal feedback by providing clarification when step 1(Sd presentation) not performed correctly			
2a. The trainer provided an opportunity to rehearse step 1 if incorrectly performed			
3. The trainer utilized behavior specific praise when the participant implemented correctly step 2 of the errorless sequence (present 0 second prompt) OR provided corrective verbal feedback by providing clarification when step 2 (0 second prompt) not performed correctly			
3a. The trainer provided an opportunity to rehearse step 2 if incorrectly performed			
4. The trainer utilized behavior specific praise when the participant implemented correctly step 3 of the errorless sequence (Re-state Sd) OR provided corrective verbal feedback by providing clarification when step 3 (Re-state Sd) not performed correctly			
4a. The trainer provided an opportunity to rehearse step 3 if incorrectly performed			
5. The trainer utilized behavior specific praise when the participant implemented correctly step 4 of the errorless sequence (present 1-2 easy trials) OR provided corrective verbal feedback by providing clarification when step 4 (present 1-2 easy trials) not performed correctly			
5a. The trainer provided an opportunity to rehearse step 4 if incorrectly performed			
6. The trainer utilized behavior specific praise when the participant implemented correctly step 5 of the errorless sequence (Re-state Sd) OR provided corrective verbal feedback by providing clarification when step 5 (Re-state Sd) not performed correctly?			
6a. The trainer provided an opportunity to rehearse step 5 if incorrectly performed			
7. The trainer utilized behavior specific praise when participant implemented correctly step 6 of the errorless sequence (Delivers Sr+) OR provided corrective verbal feedback by providing clarification when step 6 (Delivers Sr+) not performed correctly?			
7a. The trainer provided an opportunity to rehearse step 6 if incorrectly performed			
8. The trainer recorded the duration of the BPF session on the data collection sheet for the respective skill			
9. The trainer did NOT employ modeling of any step in the errorless teaching sequence			
10. The trainer addressed all questions generated by the participant with explanations			
11. The trainer provided additional opportunities to practice if requested by the participant			
12. Did the trainer follow the BPF intervention script?			
Notes:	____ / 11 Percentage of Y's:		

Figure 17. Treatment fidelity checklist for BPF

Behavioral Skills Training Fidelity Checklist

Date: _____ Trainer/Researcher: _____ Participant: _____

Independent Observer 1: _____Independent Observer 2 _____ IOA% _____

	YES	NO	N/A
1. The trainer started a timer at the beginning of the training session			
2. The trainer provided written/typed instructions for the respective skill and asked the participant to read them			
3. The trainer reviewed with the participant all steps of the errorless sequences with explanations			
4. The trainer modeled the implementation of the errorless teaching sequence for target sample 1 prior allowing the participant to rehearse the errorless teaching sequence			
5. The trainer modeled the implementation of the errorless teaching sequence for target sample 2 prior allowing the participant to rehearse the errorless teaching sequence			
6. The trainer modeled the implementation of the errorless teaching sequence for target sample 3 prior allowing the participant to rehearse the errorless teaching sequence			
7. The trainer provided opportunity to the participant to rehearse target sample 1			
8. The trainer provided feedback to the participant based on performance with target sample 1			
9. The trainer provided opportunity to the participant to rehearse target sample 2			
10. The trainer provided feedback to the participant based on performance with target sample 2			
11. The trainer provided opportunity to the participant to rehearse target sample 3			
12. The trainer provided feedback to the participant based on performance with target sample 3			
13. The trainer assessed implementation of 3 additional sample targets to specified criterion (i.e., 100%) prior implementation of targets with the student			
14. The trainer addressed all questions generated by the participant regarding the training session recently concluded ONLY			
15. The trainer recorded the duration of the training session on the datasheet for the respective skill			
Notes:	____ / 15 Percentage of Y's:		

Figure 18. Treatment fidelity checklist for BST

Instructions Implementation Fidelity Checklist

Date: _____ Trainer/Researcher: _____ Participant: _____

Independent Observer 1: _____Independent Observer 2 _____ IOA% _____

		YES	NO	N/A
1.	The trainer begins a timer at the beginning of the intervention			
2.	The trainer provided the participant with typed instructions for the respective skill and asked the participant to read them			
3.	Once the participant finished reading the typed instructions the trainer recorded the duration of participant's reading time			
4.	The trainer did NOT review any of the steps of the errorless teaching sequence with the participant			
5.	The trainer did NOT model any of the steps of the errorless teaching sequences for the participant			
6.	The trainer did NOT provide opportunities for rehearsal of any of the skills of the errorless sequence			
7.	The trainer did NOT provide feedback regarding any of the steps of the errorless sequence			
8.	The trainer did NOT provide the participant with opportunities for questions OR answered any questions generated by the participant			
Notes:		____ / 8 Percentage of Y's:		

Figure 19. Treatment fidelity checklist for typed instructions

Appendix E Social Validity

Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992)

Participant _____ Date: _____

BRIEF PERFORMANCE FEEDBACK: PI PROVIDED VERBAL FEEDBACK BASED ON PERFORMANCE FOLLOWING THE OBSERVATION. IF ERRORS WERE MADE ON SPECIFIC STEPS, THE PI PROVIDED OPPORTUNITIES FOR SKILL REHEARSAL (NO INSTRUCTIONS OR MODELING WERE USED)

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
This is an acceptable training for me and the student's behavior	1	2	3	4	5	6
The training was effective in helping me changing the student's behavior	1	2	3	4	5	6
The student's behavior justified the use of this training for me	1	2	3	4	5	6
This training did not have had bad side effects for me or my student	1	2	3	4	5	6
I liked this training	1	2	3	4	5	6
The training was a good way to teach my student new behavior or skills	1	2	3	4	5	6
Overall, the training would help me and my student.	1	2	3	4	5	6

Total score: _____

Figure 20. Abbreviated acceptability rating profile for BPF

Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992)

Participant _____ Date: _____

BEHAVIORAL SKILLS TRAINING- PI PROVIDED INSTRUCTIONS, MODELING, SKILL REHEARSAL AND PERFORMANCE FEEDBACK PRIOR WORKING WITH MY STUDENT

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
This is an acceptable training for me and the student's behavior	1	2	3	4	5	6
The training was effective in helping me changing the student's behavior	1	2	3	4	5	6
The student's behavior justified the use of this training for me	1	2	3	4	5	6
This training did not have had bad side effects for me or my student	1	2	3	4	5	6
I liked this training	1	2	3	4	5	6
The training was a good way to teach my student new behavior or skills	1	2	3	4	5	6
Overall, the training would help me and my student.	1	2	3	4	5	6

Total score: _____

Figure 21. Abbreviated acceptability rating profile for BST

Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992)

Participant _____ Date: _____

TYPED INSTRUCTIONS: THE PI PROVIDED TYPED INSTRUCTIONS SPECIFIC TO THE TARGET BEHAVIOR PRIOR THE BEGINNING OF THE SESSION. NO QUESTIONS OR ANSWERS/NOR OPPORTUNITIES FOR FEEDBACK OR PRACTICE SKILLS WERE PROVIDED

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
This is an acceptable training for me and the student's behavior	1	2	3	4	5	6
The training was effective in helping me changing the student's behavior	1	2	3	4	5	6
The student's behavior justified the use of this training for me	1	2	3	4	5	6
This training did not have had bad side effects for me or my student	1	2	3	4	5	6
I liked this training	1	2	3	4	5	6
The training was a good way to teach my student new behavior or skills	1	2	3	4	5	6
Overall, the training would help me and my student.	1	2	3	4	5	6

Total score: _____

Figure 22. Abbreviated acceptability rating profile for typed instructions

Social Validity Questionnaire

1. WHAT DID YOU LIKE THE MOST ABOUT THIS TRAINING?

2. WHAT DID YOU LIKE THE LEAST ABOUT THIS TRAINING?

3. HOW DID YOU FIND THIS TRAINING HELPFUL?

4. WHAT COMPONENT(S) OF THIS TRAINING YOU FOUND MOST BENEFICIAL TO YOUR INSTRUCTION?

5. DID YOU LIKE THIS TRAINING? WHY?

6. WAS THIS TRAINING EFFECTIVE AT IMPROVING YOUR INSTRUCTIONAL BEHAVIOR?

Figure 23. Social validity questionnaire

University of Pittsburgh
Institutional Review Board

Human Research Protection Office
3500 Fifth Avenue, Suite 106
Pittsburgh, PA 15213
Tel (412) 383-1480
www.hrpo@pitt.edu

APPROVAL OF SUBMISSION (Exempt)

Date:	July 22, 2019
IRB:	STUDY19030207
PI:	Miguel Ampuero
Title:	Comparing the Effectiveness and Efficiency of Behavioral Skills Training and Brief Performance Feedback Interventions During the Paraprofessional Supporting Students with Autism Spectrum Disorder
Funding:	None

The Institutional Review Board reviewed and approved the above referenced study. The study may begin as outlined in the University of Pittsburgh approved application and documents.

Approval Documentation

Review type:	Initial Study
Approval Date:	7/22/2019
Exempt Category:	(1) Educational settings
Approved Documents:	• Easter Seals South Balwin Permission letter .pdf, Category: External Site Permission Letter; • Exempt Educational strategy BST BPF Para Study REVISED .docx, Category: IRB Protocol; • Exempt Informational Script - Comparing the effectiveness and efficency of BST BPF study_REVISED.pdf, Category: Recruitment Materials; • Frick ECS permission letter.pdf, Category: External Site Permission Letter;

As the Principal Investigator, you are responsible for the conduct of the research and to ensure accurate documentation, protocol compliance, reporting of possibly study-related adverse events and unanticipated problems involving risk to participants or others. The HRPO Reportable Events policy, Chapter 17, is available at http://www.hrpo.pitt.edu/.

Clinical research being conducted in an UPMC facility cannot begin until fiscal approval is received from the UPMC Office of Sponsored Programs and Research Support (OSPARS).

If you have any questions, please contact the University of Pittsburgh IRB Coordinator, Larry Ivanco.

Please take a moment to complete our Satisfaction Survey as we appreciate your feedback.

Figure 24. IRB approval letter

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