Spring 5-7-2021

The Effects of Asian Immigrant Parent Implemented Training on Mand Acquisition of Children with Autism

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THE EFFECTS OF ASIAN IMMIGRANT PARENT IMPLEMENTED TRAINING ON MAND ACQUISITION OF CHILDREN WITH AUTISM

A Dissertation

Submitted to the School of Education

Duquesne University

In partial fulfillment of the requirements for

the degree of Doctor of Philosophy

By

Xiaohan Chen

May 2021

DUQUESNE UNIVERSITY

SCHOOL OF EDUCATION

Department of Counseling, Psychology, and Special Education

Dissertation

Submitted in Partial Fulfillment of the Requirements
For the Degree of Doctor of Philosophy (Ph.D.)

Special Education Doctoral Program

Presented by:

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M.S.Ed., Special Education, Duquesne University, 2016
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ABSTRACT

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By

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May 2021

Dissertation supervised by Dr. Ann X. Huang,

Asian population is proportionally the fastest-growing ethnic group in the United States and Asian parents often hold different opinions on family functioning and childrearing. However, there has been no research conducted to examine how to best train parents from Asian immigrant backgrounds to teach manding to their children with autism at home. A behavioral skills training (BST) package was utilized to teach three Asian parents to train their children with autism aged between 6-12 to mand for preferred items. A multiple-baseline-across-participants design was used to evaluate the effects of parent training on parent participants' implementation of mand training task analysis and the effects of the parent-delivered training on the acquisition of mands of their children with autism. All three parent participants demonstrated significant improvement in their task analysis implementation from zero to low percentage of accuracy in baseline phases to 100% accuracy in intervention phases following the parent training. All three

child participants emitted low levels of unprompted mands including two children demonstrating none in baseline phases. After receiving mand training from their parents, all three children demonstrated an increase in their use of unprompted mands. Two of them acquired two and four mands, respectively. The three parent-child dyads demonstrated different levels of maintenance and generalization of the skills acquired. Implications of the findings and characteristics of supporting Asian immigrants with children with autism are discussed.

ACKNOWLEDGEMENT

When I reflect on my Ph.D. career and the journey of completing this dissertation, I have many individuals I am thankful for. First and foremost, I would like to thank my committee chair, Dr. Ann Huang who has been my mentor since day one of my Ph.D. study. Thank you for your insightful feedback and continuous support for my dissertation. I am forever thankful for your guidance, patience, and encouragement throughout my entire Ph.D. journey.

I would also like to thank my committee members, Dr. Elizabeth McCallum and Dr. Bridget Green for all the time you put into reviewing my dissertation and providing detailed feedback. I would also like to extend my sincere gratitude to Dr. E. Justin Page and Dr. Morgan Chitiyo for your invaluable feedback for this project. In addition, I would like to thank Dr. Rachel Kittenbrink and Mr. Jim Miller for your wonderful suggestions and support for my dissertation and for showing me how to be a good behavior analyst.

Last but certainly not least, I am deeply indebted to my dear husband Weier for his tireless patience and so much more. Thank you for always being there for me to cheer me up when I am down and to encourage me to achieve more. I am very grateful for your unparallel love, patience, and support. I could not have done it without you. I would also like to thank my parents and sister who have always given me their full support for my education.

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Chapter I

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by three core deficits: social interaction, communication, and restrictive, repetitive behaviors (American Psychiatric Association [APA], 2013). These are hallmarks that distinguish children with autism (used interchangeably with "children with ASD" in the present study) from those who are typically developing or having developmental delays (Ventola et al., 2007). Children diagnosed with ASD may exhibit difficulties in social communication and interaction in one or more of the following areas: social-emotional reciprocity, nonverbal communicative behaviors (e.g., body language, facial expressions), and developing, maintaining, and understanding relationships (APA, 2013). Although many children with ASD may have spoken words, they tend to have difficulties in using language functionally (Norrelgen et al., 2014).

Children who do not acquire functional communication to effectively express their wants and needs often are at a higher risk of displaying challenging behaviors (Carr & Durand, 1985; Willinger et al., 2003) which often serve a communicative function (Winborn et al., 2002). Therefore, teaching these children appropriate ways to communicate can improve their social skills and decrease instances of challenging behaviors. Approximately 40% of the children diagnosed with ASD need to be specifically taught how to communicate needs, express likes and personal preferences and ask for items (Suppo & Floyd, 2012). Such teaching is essential in helping them develop social communication skills (Gates et al., 2017). Early intensive behavior intervention (EIBI) with specific language acquisition targets have shown positive outcomes for children with ASD to develop functional communication (Eigsti et al., 2011). EIBI typically has a focus on manding (i.e., requesting) as it directly benefits children (Shillingsburg et al., 2020).

That is, they obtain the items they want in an appropriate way when they learn to request them, which increases their ability to control their environments (Sundberg & Michael, 2001).

Mand training is recognized as an evidence-based intervention for teaching language to children with ASD (National Autism Center, 2009). It is effective for improving communication skills and should be a top instructional priority when a child with ASD has delayed development of vocal manding (Sundberg & Michael, 2001). Research has shown that involving caregivers in mand training promotes language acquisition in children with developmental disabilities (Hong et al., 2016). Parents are the most critical facilitators of learning for their young children (Powell & Dunlap, 2010). Since children with ASD demonstrate difficulties in social communication early on and spend most of their day with their parents, parents are ideally situated to embed training sessions across various settings. In addition, teaching caregivers to conduct mand training with their children can help reduce the intensity of services and hence decrease the cost of the treatments. It is also reported that training caregivers to promote their children's communication skills may result in a decrease in the children's problem behavior (Smith et al., 2011) and a decrease in parental stress (Loughrey et al., 2014). Therefore, teaching caregivers to conduct mand training provides great benefits to both children with autism and their parents.

Asian immigrant families who have children with ASD and other disabilities have reported many challenges of engaging in their children's special education and related services (Baker et al., 2010). This was mainly due to their cultural and language barriers, limited access to health information and treatment options, and different values and beliefs (Jegatheesan et al., 2010). In addition, they often hold different perspectives on childrearing (Lau et al., 2010). Therefore, it is important for professionals to offer culturally sensitive supports when involving parents from Asian immigrant backgrounds in mand training or other procedures.

Significance of the Study

The present study was the first to explore the efficacy of parent training for Asian immigrants using behavioral skills training (BST) on mand training for children with ASD. Parenting a child with autism can be extremely difficult and stressful (Hayes & Watson, 2013; Silva & Schalock, 2012). This is particularly true for families from immigrant backgrounds, as they tend to experience greater barriers in accessing, using, and complying with intervention services for their children, when compared to families from the host country (Millau et al., 2018). Due to these barriers and the sophisticated nature of autism, immigrant parents are often uncertain of their abilities to positively influence their children's interventions. Therefore, providing immigrant parents with a guided protocol on how to teach their children with ASD allows them to gain access to practical skills to effectively work with their children, which promotes positive interactions between them (Dawson, 2008).

Manding is defined as requesting something that an individual wants at the moment (Plavnick & Vitale, 2016). It is a vital social skill that allows children with ASD to use effective ways to respond to their environment (Skinner, 1957). Engaging their parents in delivering mand training provides them with ample opportunities to receive interventions from significant persons in their natural environment during daily routines (Nevill et al., 2018). It not only increases treatment opportunities (Straiton et al., 2020), but also enhances generalization of learned skills across various natural settings (Gerow et al., 2018).

Although many interventions for individuals with ASD have an increasingly robust body of evidence, a major limitation is their lack of representation of cultural minority children and families (Hall, 2001; Lau, 2006). The present study serves to fill the gap in literature and help broaden the understanding of the use of BST, parent training, and mand training and their effects

on families from Asian immigrant backgrounds who are underrepresented in health-related research (Zamora et al., 2016). Therefore, this study is of significance because of its practical contributions to the development of culturally sensitive parent training and mand training protocols. It also contributes to the limited literature on Asian immigrants raising children with autism. Additionally, it highlights the importance of training Asian immigrants to meet the rising needs of a growing culturally and linguistically diverse community in this country.

Theoretical Bases for the Study

Applied Behavior Analysis

Founded on the science of behavior, applied behavior analysis (ABA) studies the functional relations between the antecedent and consequence of a socially significant behavior (Cooper et al., 2020). The term antecedent refers to environmental conditions or stimulus changes that exist or occur prior to the behavior of interest (Cooper et al., 2020). Consequences follow behaviors and are the driving force behind behaviors (Skinner, 1938). There are three main types of consequences: reinforcement, punishment, and extinction. A socially significant behavior means that the behavior targeted for change is of great importance to the individual and society (Baer et al., 1968).

The focus of an ABA intervention is to produce visible improvement in socially relevant behaviors such that other people in the individual's life can identify positive behavioral change (Baer et al., 1968, 1987). Among evidence-based practices for individuals with ASD, ABA-based interventions are considered the most effective treatments (Fein et al., 2013) supported by substantial evidence (e.g., Eldevik et al., 2010; Kuppens & Onghena, 2012; McEachin et al., 1993; Peters-Scheffer et al., 2011; Virués-Ortega, 2010; Weiss, 1999). The present study utilized many of the principles of ABA such as positive reinforcement. Specifically, preferred items were

identified by conducting preference assessments with the child participants of the study. Those items were then used as reinforcers throughout the investigation to promote mand acquisition of the child participants.

Verbal Behavior

From a behavioral perspective, communication can be conceptualized based on B. F. Skinner's (1957) functional description of verbal behavior. Language training programs incorporating Skinner's account of verbal behavior have shown success in improving communication skills of children with autism (Mudford et al., 2009). According to the functional relationship between the behaviors and their specific antecedents and consequences, Skinner presented a taxonomy of six verbal operants including mand, tact, echoic, intraverbal, textual, and transcription. One of these operants, the mand, is under investigation in the current study. In lay language, a mand is a request for something (e.g., item or activity) that one is motivated to obtain (Plavnick & Vitale, 2016).

Mand is under the control of motivating operations (MO) that increase or decrease the value of an item as a reinforcer (Laraway et al., 2003). Mand training is conducted by manipulating MOs and presenting a stimulus to increase the likelihood an individual emits the mand for the stimulus (Jennett et al., 2008). For example, putting a preferred toy in a closed transparent container to increase a learner's MO to mand for the teacher to open the container to access the toy. Mand is of primary importance as it is the first form of verbal behavior children acquire (Skinner, 1957), and directly benefits the learners as it allows them to control the delivery of reinforcement by others (Sundberg & Michael, 2001).

Relevant Literature of the Current Study

Mand Training

Mand training is recognized as an evidence-based intervention rooted in ABA for teaching the requesting behaviors (Sundberg & Michael, 2001) and has shown positive effects on improving communication skills of children with ASD in numerous studies. Recognized the necessity to teach mands to escape aversive stimulus, Shillingsburg et al. (2013) taught five young children with autism to mand to remove a stimulus to access preferred items. For example, teaching the children to mand for the removal of obstructions in front of the television while a preferred movie was playing. An establishing operation (EO)-present mand for removal was a mand emitted by a participant when an item was blocking their view of the TV. An EO-absent mand emitted by a participant was when there was no obstruction of the preferred item. An alternative treatment design was used to evaluate the effects of mand training in this study. Results showed that during baseline, none of the participants emitted mands to remove the obstructing stimulus of their preferred items. After receiving mand training, all participants acquired mands for the removal of the stimulus only during the EO-present condition.

More recently, Drasgow et al. (2016) conducted a study to evaluate the structure of a response class when new mands are mastered via mand training. The participants were three children diagnosed with ASD with no spoken language, sign language or conventional gestures and they used leading and reaching to make requests. The researchers investigated three factors related to mand training. Firstly, they examined whether they could replace existing mands by teaching new mands. Secondly, they examined participants' responding under immediate- and delayed- reinforcement conditions. Thirdly, they assessed the generalization skills of the participants of their new mands to novel social partners. The researchers used a reversal design

to evaluate the effects of mand training and examine participants' responding under both the immediate- and delayed- reinforcement conditions. Results showed that all three participants acquired new mands (i.e., signs for "more" and "please"). Two of the three children emitted the new mands under both reinforcement conditions. All participants demonstrated generalization of the newly learned mands and two of them alternated between the new mands with novel social partners.

Parent Training

Parents play a critical role in their children's development and education. The importance of parental involvement in children's educational experiences has been substantially documented in the literature (e.g., Barbera, 2007; Henderson & Mapp, 2002; Hiatt-Michael, 2001). Teaching parents to be responsive shapes their children's development and demonstrates positive long-term outcomes (Powell & Dunlap, 2010). Family engagement has been emphasized by the Individuals with Disabilities Education Act (IDEA, 2004) that families must be provided with opportunities to participate in decision-making, program planning, and treatment implementation regarding their children's education and related services. Parent involvement in early intervention is directly related to its efficacy (Mahoney, 2009).

There is an extensive body of literature supporting parent training as an effective intervention method for children with ASD (e.g., Ben Chaabane et al., 2009; Charlop-Christy & Carpenter, 2000; Hemmeter & Kaiser, 1994; Ingersoll et al., 2016; Mobayed et al., 2000). Through training delivered by professionals, parents learn specific techniques to work with their children as the change agent (Postorino et al., 2017). Specifically, parents have successfully acquired skills to promote social communication (Ingersoll & Wainer, 2013), reduce disruptive

behaviors (Bearss et al., 2013), and improve imitation skills (Ingersoll & Gergans, 2007) of their children with ASD.

Ingersoll and Wainer (2013) reported they trained eight parents to promote social communication skills of their children with ASD using project ImPACT (i.e., Improving Parents as Communication Teachers). In their study, parent participants were provided with a manual containing information of Project ImPACT intervention techniques. Trainers worked with the parents to set goals and modeled the techniques with the child participants for the parents and then parents practiced the techniques while trainers provided feedback. Each of the intervention technique aligned with a specific dimension of parent fidelity. The researchers examined the parents' use of each fidelity dimension as it was introduced and their average fidelity across all dimensions. A multiple baseline across participants design was used to examine the effectiveness of Project ImPACT for improving parents' intervention fidelity on their children's spontaneous language. The results of the study showed that all parents improved fidelity scores and six of the eight children demonstrated improvements in spontaneous language targets. The researchers concluded that a significant association is identified between the parents' implementation of intervention strategies and their children's spontaneous language use.

Bearss et al. (2013) trained parents to use a modified parent training program developed by the Research Units on Pediatric Psychopharmacology with their children with ASD accompanied by disruptive and noncompliant behavior to assess feasibility and efficacy of the program. Feasibility was defined as evidence that the treatment is acceptable to the families and the manual can be delivered across families. Efficacy was defined as a reduction in parent-reported disruptive behaviors and an increase in adaptive functioning. Sixteen families participated and 14 of them completed the treatment. The study was a 6-month open trial that

included 11 core sessions, up to two optional sessions, two home visits, and three booster sessions. Measures included clinician-administered interviews and parent and teacher questionnaires, such as Aberrant Behavior Checklist, Home Situations Questionnaire, Parent Satisfaction Questionnaire, etc. Results of the study supported the feasibility and preliminary efficacy of the parent training program for children with ASD who have disruptive behaviors. Findings suggested that parents found the intervention acceptable, and the program may result in reductions in disruptive and noncompliant behaviors and gains in adaptive functioning of children with ASD.

In another study, Ingersoll and Gergans (2007) successfully taught three parents to implement reciprocal imitation training (RIT) to increase spontaneous object and gesture imitation of their children with autism. Two mothers were trained to implement RIT techniques to teach object imitation, and the third parent was taught to use RIT to teach object and gesture imitation. The researchers used a multiple-baseline-across-participants design to assess the effects of parent-implemented RIT on spontaneous imitation of children with autism. Results showed that all parents learned to use the intervention strategies and their children exhibited increases in spontaneous imitation. In addition, parents also reported that the intervention led to positive changes in their children's social engagement, play skills, and communication.

One common approach to train parents is behavioral skills training (BST). It is a set of systematic procedures that consist of instructions, modeling, rehearsal, and feedback on implementation (Miltenberger, 2004). BST has been widely used to train parents with limited experience in behavior analysis to effectively implement behavioral skills with children with autism. For example, Harriage et al. (2016) used BST to train three parents to implement most-to-least prompting procedures in teaching their children to use pedestrian safety skills. The

researchers used a multiple-baseline-across-participants design to examine parent implementation of in situ pedestrian safety skills training and the correct use of safety skills by the child participants with autism. Results showed that parents implemented in situ, most-to-least prompting procedures with high levels of accuracy during intervention and fading of BST. All child participants significantly improved their pedestrian safety skills during intervention and maintained their skills at the 1-month follow-up.

Asian Immigrants in the United States

According to data from the Pew Research Center (2017), as of 2015, with 20.4 million, Asian American was proportionally the fastest-growing racial or ethnic group in the United States, of which, about 59% were first-generation immigrants. The topic of special education services for children from Asian backgrounds has received scant attention (Wang & Casillas, 2012). It is even more so for first-generation immigrants from Asian countries. Therefore, the present study focused on first-generation Asian immigrants in the United States.

Immigrant families often face various barriers when seeking services for their children with ASD due to cultural and language barriers, reduced social networks, and transportation challenges (Fellin et al., 2013; Greenwood et al., 2014). In addition, immigrant parents may have different perspectives on disabilities and limited awareness of the availability of services in the host country (Alegria et al., 2011). As a result, children with ASD from immigrant families have limited access to resources, and, eventually, to positive outcomes (Chiao & Blizinsky, 2013). Furthermore, disability-related stigma is well documented in Asian cultures (e.g., Chang & Kemp, 2004; Cheon & Chiao, 2012; Minhas et al., 2015) that individuals of Asian backgrounds are more likely to perceive negative attitudes toward disabilities (Chan et al., 2002). This places

an additional challenge for Asian immigrant families raising children with autism (Kim et al, 2020).

Problem Statement

As the population of Asian immigrants in the U.S. increases, correspondingly, the number of Asian immigrant families with children with ASD also grows, as autism occurs in all races and ethnicities (Croen et al., 2002). This growing number compounded with their different cultural backgrounds and childrearing beliefs warrant further research in an effort to understand their barriers and find a pathway to promote culturally competent services. Yet, literature on the experiences of Asian immigrant families with children with autism is limited. Although the number of research studies in the field of autism and ABA in recent years has dramatically increased, most of them were conducted with European American samples (Dyches et al., 2004), and little attention was paid to topics on services for the ethnic minority groups (Pierce et al., 2014). Given the deficiency of research with ethnic minorities, researchers argued that data generated from existing research are not generalizable beyond populations of Anglo origins (Bernal & Scharró-del-Río, 2001; Hall, 2001).

There has been a paucity of evaluation and dissemination of evidence-based treatments with minority communities (Lau, 2006). For example, although BST is recognized as an evidence-based approach to teaching individual new skills, currently, there is no research specifically evaluating its effects on training parents with Asian immigrant backgrounds. Therefore, its efficacy on Asian parents is unknown. Similarly, parent training is a well-supported treatment for increasing communication performance of children with autism (Siller & Sigman, 2002). Yet questions have been raised about its dissemination to culturally diverse families who hold different views on childrearing (Lau et al., 2010). In addition, there is no

research on parent training on mand training for Asian immigrant parents of children with ASD. Hence, the effects of training Asian immigrant parents to teach their children manding are unknown. More research is warranted to address the gap of representation of cultural minority groups in research and examine the effectiveness of these treatments across cultural and linguistic contexts.

Another concern is that many studies on parent-implemented mand training reported children's outcomes resulting from parent training with a focus on measuring the children's mand frequency (i.e., how many times a mand is emitted) of both unprompted and prompted mands (e.g., Ben Chaabane et al., 2009; Suberman, 2017). Limited studies focused on measuring their mand acquisition (i.e., how many mands acquired or mastered) of unprompted mands or otherwise called independent mands. Pivoting on measuring mand frequency without striking a balance between frequency and acquisition can be problematic as a learner can be trained to mand many times for a limiting number of items instead of manding for a variety of items. A strong mand repertoire allows a learner to effectively control his/her environment by increasing access to various reinforcers and by increasing the value of interacting with other members of the verbal community (Sweeney-Kerwin, 2007). The current study extends the literature on mand training by reporting results of the percentage of unprompted mands emitted by the children and the number of mands they acquire after receiving parent-implemented mand training.

Taken together, the purpose of the study was threefold. First, it aimed to evaluate how well Asian immigrant parents can implement mand training procedures with their children with ASD after they received training from the researcher. Second, it evaluated the effectiveness of evidence-based practices such as behavioral skills training and mand training when used with

Asian immigrant families. Third, it assessed child outcomes from the mand training mediated by their parents with a measure of mand acquisition of target items.

Research Questions

This study investigates the effects of a multi-component training package which consists of parent training using BST on mand training on the mand acquisition of children with ASD. It was conducted to answer the following research questions:

Research question 1: To what extent will Asian immigrant parents in the United States be trained through BST to implement mand training procedures with their children with ASD?

Research question 2: To what extent will the child participants' mand acquisition be impacted by the parent-implemented mand training?

Chapter II

Literature Review

The following chapter reviews literature concerning mand training delivered by parents using behavioral skills training (BST) for their children with autism spectrum disorder (ASD) displaying deficits in vocal manding. A broad overview of ASD is followed by a description of applied behavior analysis (ABA) principles as the theoretical basis of the intervention. Mand training for children with ASD is discussed within the framework consistent with Skinner's (1957) analysis of verbal behavior. This chapter also presents an overview of studies on the value and effects of parent training for children with ASD and their families. BST is then discussed as an approach to delivering parent training. Finally, this chapter concludes with a description of the significance and necessity of including participants of Asian backgrounds in the current study.

Historical Background

Prevalence of ASD

Over the past several decades, there has been a dramatic increase in the number of children diagnosed with ASD. The most recent update on the prevalence of autism from the Centers for Disease Control and Prevention (CDC, 2018) indicates that 1 in 59 children under the age of eight (1 in 37 boys and 1 in 151 girls) have ASD, a 15% increase from the data reported in 2016. This rapid increase and the nature of autism necessitate early identification and early implementation of evidence-based interventions.

ASD and Social Communication

Autism spectrum disorder (ASD) is a group of neurodevelopmental disorders characterized by three core symptom domains: impairments in communication, social interaction, and the presence of repetitive and restricted behaviors and interests (APA, 2013). In

the communication domain, deficits are typically manifested through poor conversational skills and impairments in nonverbal communication behaviors (APA, 2013). Deficits in conversational behaviors include difficulties initiating or responding to social interactions (Wolfe et al., 2019), and failure to maintain a reciprocal conversation (Volden, 2004). Deficits in nonverbal communication behaviors include making inappropriate facial expressions and/or gestures (Parladé & Iverson, 2015), and demonstrating limited eye contact and poor joint attention during social interactions (Bottema-Beutel, 2016; Heymann et al., 2018). Additional symptoms may also include difficulties in sharing interests and emotions with others and adjusting behaviors to various social settings, as well as understanding and forming relationships (Wolfe et al., 2019).

Social communication deficits are usually evident before the age of three years and adversely impact a child's development (Mundy, 2016). Delayed communication and limited language repertoire impact a child's ability to effectively express their wants and needs (Willinger et al., 2003). As a result, children with ASD often exhibit challenging behaviors (e.g., tantrum, aggression, self-injury; Matson et al., 2009) as an avenue to obtain preferred things like attention and toys (Beavers et al., 2013), which negatively impacts their daily functioning.

Mounting evidence shows a strong association between impairments in communication and high levels of challenging behaviors in children with ASD (e.g., Bauminger et al., 2010; Gray et al., 2012; Hartley et al., 2008; Kanne & Mazurek, 2011; Matson et al., 2009; Mazurek & Kanne, 2010), including both internalized problems, such as depression, anxiety, and withdrawal, and externalized behaviors, such as aggression, self-injury, and destruction of property (Boonen et al., 2014; Lecavalier, 2006; McClintock et al., 2003). These maladaptive behaviors place children with ASD and their families at risk for a range of negative outcomes. Behavioral problems can interfere with the child's daily functioning, learning, and intervention

outcomes, thereby hindering their overall improvement across the lifespan (Kanne & Mazurek, 2011; Taylor & Seltzer, 2011). Challenging behaviors also result in poorer family functioning with increased negativity in parenting perceptions and poorer social functioning (Sikora et al., 2013).

Given that disruptive behaviors serve as a communicative channel in many children with limited language abilities, a growing body of literature emphasized the significance of improving social communication skills during the initial stages of development (Koegel et al., 2009). Teaching a functionally alternative behavior, such as appropriate verbal communication, decreases the occurrence of challenging behaviors, as the acquisition of language allows the children to make their desires and thoughts known to others around them (Sundberg & Michael, 2001). Verbal communication interventions based on the principles of ABA use systematic approaches to remedy the core deficits and decrease challenging behaviors of children with ASD (Dixon et al., 2019).

Theoretical Foundations of the Study

Applied Behavior Analysis

Applied behavior analysis (ABA) is a scientific approach to "discovering environmental variables that reliably influence socially significant behaviors and developing a technology of behavior change that takes practical advantage of those discoveries" (Cooper et al., 2020, p. 2). Founded on the science of behavior, ABA studies the functional relations between the antecedent and consequence of a socially significant behavior (Cooper et al., 2020). A socially significant behavior means that the behavior targeted for change is of significance to the individual and his/her families (Baer et al., 1968). The focus of an ABA intervention is to produce visible

improvement in socially relevant behaviors such that other people in an individual's life can identify positive behavioral change (Baer et al., 1968, 1987).

Critical Elements of ABA. According to Skinner's three-term contingency relation of antecedents, behavior, and consequences (A-B-C), the relation between the antecedent and the behavior exists because of the consequences that occurred for previous A-B relations (Moxley, 2004). That is, consequences are the driving force behind behaviors (Skinner, 1938). A reinforcing consequence immediately follows a behavior and increases the future frequency of the behavior under similar conditions. On the other hand, a punishing consequence immediately follows a behavior and decreases the future frequency of the behavior under similar conditions. Extinction is also a consequence used to reduce behaviors. It occurs when reinforcement of a previously reinforced behavior is discontinued and consequently the frequency of the behavior decreases in the future (Cooper et al., 2020).

The term antecedent refers to environmental conditions or stimulus changes that exist or occur prior to the behavior of interest (Cooper et al., 2020). One type of antecedent variable is called discriminative stimulus (S^D). An S^D is a stimulus in the presence of which a given response is reinforced and in the absence of which the same response has occurred but has not been reinforced (Cooper et al., 2020). Essentially, it is an indicator of "what to do to get what you want" (Martin & Pear, 2007, p. 245). Establishing operation (EO) is another type of antecedent variable. It was first defined by Michael (1993) as a term for any environmental variable that "affects an organism by momentarily altering (a) the reinforcing effectiveness (value) of other events, and (b) the frequency of occurrence of that part of the organism's repertoire relevant to those events and consequences" (p. 192). Both value-altering and behavior-altering effects impact a behavior in two ways. They either increase or decrease the reinforcing

effects or the frequency of behavior. Motivating operation (MO) was later used to replace the term establishing operation (Laraway et al., 2001), because "establishing" implies an increase in the effects of a consequence as a reinforcer (Laraway et al., 2003). The term MO is used throughout the remainder of the present paper.

Seven Dimensions of ABA. In 1968, Baer, Wolf, and Risley published the paper "Some Current Dimensions of Applied Behavior Analysis", in which they outlined the scope of work in this field and recommended that applied behavior analysis should be applied, behavioral, analytic, technological, conceptually systematic, effective, and able to produce generalized outcomes (Baer et al., 1968). These seven dimensions continue to serve as the primary criteria for defining and evaluating the value of applied behavior analysis today (Cooper et al., 2020). Based on Baer and colleagues' (1968) definition, each of the seven dimensions is briefly reviewed here.

Applied. Applied means that when selecting behaviors to change, ABA researchers and practitioners select those that are socially significant for the individuals. By targeting and changing these behaviors, the individuals and their significant others can experience improvement in their quality of life. For example, to study bar-pressing only because it is convenient and easy to record would not be applied research. On the contrary, to study bar-pressing because it is integrated with important arithmetic skills would be applied research.

Behavioral. Behavioral means that the behavior chosen to target must be the behavior in need of change, rather than a similar behavior that "serves as a proxy for the behavior" (Cooper et al., 2020, p.36). In addition, the behavior must be observable and measurable, and its measurement must be precise and explicit. An operationally defined behavior allows practitioners to collect data on it and show change over time. For example, it would be hard to

target “anxiety” as it is not measurable; however, behaviors that are associated with it like crying and pacing can be directly targeted and measured.

Analytic. A functional relation must be demonstrated between the environmental variables and the change of the target behavior. That is, the experimenter must be able to control the occurrence and nonoccurrence of the behavior (Cooper et al., 2020). Two commonly used designs to demonstrate reliable control of behavior change are reversal designs and multiple baseline designs. In reversal designs, the experimental variable is applied and removed to assess whether the behavioral change depends on it. In multiple baseline designs, several responses are identified and measured over time, an experimental variable is applied to one response at a time to show that each behavior changes only when the experimental variable is applied to it.

Technological. The technological dimension means that procedures of interventions and research methods are described with sufficient detail and clarity that allow replications by others. For example, social reinforcement is not a technological description, and to make it technological, all the ingredients must be specified including stimuli, schedule, and contingency. Possible contingencies should include procedures to use when the individual makes alternative responses.

Conceptually Systematic. Conceptually systematic means that the procedures outlined for behavior change interventions are described based on relevant ABA principles. Baer and colleagues gave an example that when teaching a learner who is afraid of height to jungle-gym climbing and referring the teaching procedures as a social reinforcement is conceptually systematic as it ties back to the basic concepts of behavioral development. Having this dimension ensures the descriptions of technological procedures are not a collection of tricks or from other non-ABA fields.

Effective. An effective intervention must produce behavior changes that reach clinical significance instead of statistical significance. Baer and colleagues recommended that individuals who deal with the behaviors and their significant others should be asked how much the behaviors need to be changed. In other words, the amount of the behavioral changes should be meaningful and have social significance to them.

Generality. Generality is evident when the behavior change continues after the treatment has been withdrawn, the change in target behavior occurs in nontreatment settings, or spreads to other behaviors not directly worked on in treatment. For example, when a child is taught to properly wash hands in the clinic, and then he can do it at home without teaching means he is able to generalize learned behavior across settings. Similarly, a learner is taught to use chalk to write his name on a blackboard and he can then use a pencil to write his name on a piece of paper also demonstrates generality.

ABA and Autism Treatment. Among evidence-based practices for individuals with ASD, ABA-based interventions are considered as the most effective treatments (Fein et al., 2013) supported by substantial evidence (e.g., Eldevik et al., 2010; Kuppens & Onghena, 2012; McEachin et al., 1993; Peters-Scheffer et al., 2011; Virués-Ortega, 2010; Weiss, 1999). Ivar Lovaas, the pioneer of ABA, had conducted research on behavioral interventions for individuals with ASD since the 1960s. His early work demonstrated that young children with ASD could learn at an accelerated rate and acquire complex skills including language (Lovaas et al., 1973).

The findings of his long-term intensive behavioral treatment study in 1987 demonstrated significant behavior improvements in children with ASD (Lovaas, 1987). Treatment goals of this study for the first year included reducing challenging behaviors, increasing compliance and establishing appropriate toy play. Treatment goals for the second year consisted of teaching

expressive language and interactive play with peers. Treatment goals for the third year focused on teaching various expression of emotions and preacademic skills. In this study, sixty children with autism were divided into three groups. Children in the experimental group received treatment for 40 hours per week for two to six years. Children in control group one received the same treatment for 10 hours per week combined with special education, and children in control group two received special education only. The results clearly showed that almost half of the children (47%) in the experimental group reached "best outcome" (i.e., indistinguishable from peers), with many even had their "autism" label removed. The control groups one and two had 0% and 5% of children respectively achieved "best outcome". Following this publication, numerous subsequent studies were conducted and provided additional evidence of the effectiveness of interventions based on ABA.

The Centers for Disease Control and Prevention (n.d.) indicated that ABA is a notable treatment approach for individuals with ASD and it is widely offered by healthcare professionals in schools and clinic settings. National Autism Centers' National Standards Report (2015) also noted that ABA-based behavioral interventions have a track record of effectiveness for individuals with autism. In addition, literature reviews and meta-analyses also reported that children with ASD who received ABA interventions made greater gains than those who did not (e.g., Eldevik et al., 2009; Peters-Scheffer et al., 2011; Virués-Ortega, 2010). An array of treatments specifically focused on addressing communication deficits based on ABA principles have been developed (Lovaas, 1977, 2003; Petursdottir & Carr, 2011), and shown success in helping children with autism develop better language skills (National Autism Project, 2009; Prelock et al., 2011; Sundberg & Michael, 2001). Within the range of various communication-

centered ABA approaches, B. F. Skinner's analysis of verbal behavior gains momentum in the existing empirical literature (Sautter & LeBlanc, 2006).

Verbal Behavior

B. F. Skinner's book, *Verbal Behavior* (1957), set the foundation for the application of behavioral principles to language learning. Since its publication, the verbal behavior approach has experienced a rapid dissemination (Carr & Firth, 2005; Normand, 2002; Sundberg & Partington, 1998) and remained a popular intervention for children with ASD (Kates-McElrath & Axelrod, 2006). Verbal behavior involves a process of communication between a speaker who emits a verbal response and a listener who mediates the reinforcement (Skinner, 1957). Unlike traditional approach to analysis of language using structural linguistic, syntactic and semantic explanations (Sundberg, 2007), Skinner defined verbal behavior based on the function of the response, rather than its form. He stated in his book that "…we do not, and cannot, specify any one form, mode, or medium. Any movement capable of affecting another organism may be verbal" (Skinner, 1957, p.14). Therefore, any response, as long as it meets the functional requirements of the definition, can be verbal regardless of its form. In other words, verbal behavior is not limited to vocal speech but can include non-vocal communication such as sign language, written text, and body gestures. For example, waving one's hand for others to come over can be verbal.

Specific language responses called verbal operants are analyzed based on functional relations, explaining the antecedent, behavior, and consequence in communicative manners (Kittenbrink, 2015). Skinner labeled types of communication into six categories and developed names for each operant including mand (request), tact (label), echoic (vocal imitation), intraverbal (answer questions or have conservations), textual (read written words), and

transcription (write and spell words heard; Skinner, 1957). Among the six types of verbal operants, mands, tacts, echoic, and intraverbal are particularly related to teaching children with autism to emit conventional response topographies (Lerman et al., 2005). Thus, these four operants are discussed in greater detail below.

Mand. The first verbal operant discussed here is the mand. Some common terms for the mand are request, ask, command, and demand. Skinner (1957) defined mand as, "a verbal operant in which the response is reinforced by a characteristic consequence and is, therefore, under the functional control of relevant conditions of deprivation or aversive stimulation" (pp. 35-36). Sundberg and Michael (2001) further elaborated on Skinner's definition by stating "mands receive reinforcement specific to the particular mand" and "mands directly benefit the speaker by producing access to desired (often unconditioned) reinforcers" (p. 706). For example, when a child mands for juice, receiving juice is the consequence and the behavior of manding for juice is then reinforced. Similarly, the mand "can I play with the car?" would be reinforced by receiving the car. In other words, the consequence of a mand is direct reinforcement of the item manded for. In addition, Skinner (1957) indicated that while the antecedent to other verbal operants is an S^D, the antecedent to mand is MO, which is a distinction between mand and other verbal operants.

It is important to note that people do not only mand for items in sight; they also use different types of mands such as (a) manding for actions (e.g., Carnett et al., 2017; Plavnick & Ferreri, 2011; Yoon & Feliciano, 2007), (b) manding for missing items (e.g., Albert et al., 2012; Hall & Sundberg, 1987), (c) manding for removal of aversive conditions (e.g., Shillingsburg et al., 2013), and (d) manding for information (e.g., Betz et al., 2010; Endicott & Higbee, 2007; Landa et al., 2017; Marion et al., 2011; Ostryn & Wolfe, 2011). In addition, there are many

response forms to use to mand for wants and needs. For example, one can mand for an item using vocal talk, manual sign language, or a selection-based system such as picture exchange communication system (PECS). The considerations when selecting a response form involve response effort (how easily mand can be emitted) and the extent of independence it allows the person.

Tact. According to Skinner (1957), tact is "defined as a verbal operant in which a response of a given form is evoked (or at least strengthened) by a particular object or event or property of an object or event" (pp. 81-82). In other terms, a tact is a labeling or naming response preceded by a discriminative stimulus. The speaker can tact using any of the five senses which are sight, hearing, smell, taste, and touch. Therefore, tact suggests that a behavior has direct contact with the physical world (Skinner, 1957). For example, if a child sees an apple on the table and says "apple", this response would be considered a tact. Also, if a child hears a train goes by and says "train", it is also a tact. The consequence of a tact is non-specific reinforcement that can include social attention or tangibles.

Echoic. Echoic is defined as a verbal operant in which another person's verbal behavior is reiterated by the speaker (Skinner, 1957). For example, if someone says "say 'banana'", the child says "banana", then this would be an echoic responding. The echoed words or sounds should be as close to adult form (i.e., "banana") as possible. However, for children who have limited language repertoire, the echoic targets can be broken into smaller word shells, such as saying "na" for "banana", then "nana", and eventually "banana". The antecedent of an echoic is someone else's vocal behavior and the response is also vocal. The consequence of an echoic behavior is also non-specific reinforcement.

Intraverbal. An intraverbal is a unit in which a speaker responds to the verbal behavior of another speaker (Skinner, 1957). An intraverbal does not have a point-to-point correspondence with the verbal stimulus that precedes it. The antecedent of intraverbal is a verbal stimulus, and the response does not duplicate the antecedent verbal behavior. In other words, the response is different than what is said in the antecedent. For example, an intraverbal response would be when hearing someone say "head, shoulders, knees, and…", the child says "toes". Teachers use intraverbal techniques frequently in class. For example, when a teacher shows a picture of a boy and asks, "it's not a girl but a …", the students would say "boy". The consequence of the intraverbal is also non-specific reinforcement. Intraverbal responding encourages a speaker to behave rapidly and accurately to verbal stimulations, which is a significant skill in interactive conversations (Sundberg, 2007).

Empirical Literature Relevant to the Current study

Mand Training

Manding occurs first in the development of language and mands are the first form of verbal behavior that children learn (Bijou & Baer, 1965; Skinner, 1957). For instance, an infant cries to mand for a diaper change or a bottle of milk. Mands are also a vital component of daily life and adult communication consists of over 50% of mands (Michael, 1988). Therefore, it is natural and reasonable to begin communication interventions by providing mand training for children with autism. Hence, the mand should be the initial operant selected for language training (Carr & Durrand, 1985; Drash et al., 1999; Kooistra et al., 2012), and should be an essential component of any treatment program for children with autism (Cooper et al., 2020). In addition to the importance of teaching mand, since mands have inherent reinforcers (Sundberg & Michael, 2001), a child who is learning to speak may have the easiest time learning to mand first

(Barbera, 2007). With regard to children with autism, it has been demonstrated that when communication attempts begin with mands, they learn to communicate faster (Sundberg & Partington, 1998).

The National Autism Center's National Standards Report (2009) conducted a meta-analysis to investigate evidence-based practices for children with Autism. The study identified mand training as an evidence-based practice for teaching language to individuals with ASD between 0-21 years of age. It reported that mand training is effective in teaching an array of target skills such as communication, interpersonal, and social skills, and in decreasing challenging behaviors and self-stimulatory behaviors.

According to Sundberg and Michael (2001), mand is the most important verbal operant to teach at an early language stage. It directly benefits the learner in various ways. First, mands allow the learner to contact reinforcers, so collateral behaviors such as responding to others and compliance with instruction could be affected (Koegel et al., 1988); second, learning mands gives the learner control over their environments, which increases the value of the training (Sundberg & Michael, 2001); and third, it sets a foundation to teach other verbal operants such as tacts and intraverbals (Cooper et al., 2020). Additionally, teaching mands provides an individual with a socially acceptable way to communicate (Drasgow et al., 2009).

Mand training can be conducted using two main strategies: antecedent strategies and consequence strategies (Albert et al., 2012). Antecedent strategies are implemented before the manding behavior. There are several procedures that have been proven effective by researchers on improving manding of children with ASD including interrupted chain procedures, incidental teaching, and time delay. The consequence strategy commonly used in mand training is differential reinforcement. It is implemented after the manding behavior.

Antecedent Strategies.

***Interrupted Chain Procedure*.** Individuals are taught to complete a behavior chain using a series of items that leads to a terminal reinforcer (Hall & Sundberg, 1987). For example, individuals may be taught to make coffee step by step using several items like cup, milk, etc. and the coffee is the terminal reinforcer. These items are established as necessary parts of the activity. During an interrupted chain procedure, an item that is essential for completing a step (e.g., cup) is removed which creates an interrupted chain. An EO is contrived for the learner to mand for the missing item as this is the only way to complete the chain and obtain the terminal reinforcer.

Hall and Sundberg (1987) provided an experimental demonstration of contriving MO through the use of interrupted chain to increase mand using sign language by two participants with hearing impairments and intellectual disabilities. Participants were taught to complete behavior chains to access final reinforcers such as coffee, and operating a vending machine to get a desired item. Once the participants could successfully access the reinforcers, the researchers interrupted the chains by withholding essential items such as a cup, and a quarter. By removing these items, the researchers contrived MOs for the participants to manually mand for them. The researchers then used prompt and prompt fading procedures to teach the mand responses. This study demonstrated that an interrupted chain procedure could be used to contrive MOs to supplement naturally occurring MOs to create opportunities for learners to practice skills. In addition, the study showed that an interrupted chain procedure could be used to teach manding for missing items to children with disabilities.

Albert et al. (2012) replicated and extended the work of Hall and Sundberg (1987) by using an interrupted chain procedure to teach three children with autism to mand for missing

items. During the pretraining sessions, the three participants were trained to complete three behavior chains independently. During the mand training sessions, the chains were interrupted, and one item was removed from the chain, which contrived MOs of teaching mands for the missing items. Vocal prompt and prompt fading procedures were incorporated in mand training. The researchers recorded the participants' mand responses as unprompted, prompted or no response. A concurrent multiple-baseline-across-activities design was used to assess the effectiveness of the interrupted chain procedures on child participants' manding behaviors. Results of their study indicated that all three participants had zero unprompted mands during baseline and then emitted unprompted mands for the missing items after they received the mand training. The researchers concluded that children with autism can be trained to mand for missing times using interrupted behavior chain.

Incidental Teaching. Incidental teaching offers a natural environment teaching approach to mand training. Hart and Risley (1968) first described incidental teaching as "the interaction between an adult and a single child, which arises naturally in an unstructured situation such as free play and is used by the adult to transmit information or have the child practice a developing skill" (p. 411). That is, the adult will arrange the environment to contain preferred stimuli of the child and wait for him/her to initiate a response, such as reaching and manding for the stimulus. The adult will provide prompts if the child does not emit a mand for the preferred item and deliver the item as reinforcer immediately after the emission of mand. Incidental teaching allows the manding skills to be practiced in naturalistic environment, which increases the likelihood of relevant use of language in natural environment and potentially promotes generalization (Kittenbrink, 2015).

Neely et al. (2016) trained three interventionists to implement incidental teaching via telehealth to teach three children with ASD manding. The interventionists arranged the environment by placing preferred items in sight but out of reach of the child participants, sabotaging a task completion or engaging in unexpected behaviors during a routine to contrive MO for the child participants to emit mands. Initiations of the child participants were defined as physical initiations, such as reaching or attempting to grab and verbal initiations, such as requesting with or without the targeted mand. Each child's target mands were different based on their treatment plans. Data were collected on the frequency of their verbal mands. A multiple-baseline-across-participants design was used to evaluate the effects of the telehealth training on interventionists' implementation of incidental teaching. The effects of incidental training on the manding behavior of child participants were also measured. Results showed that one child increased the use of target mands from 0 in baseline to a range of 3-8 mands during training. The second child increased the use of target mands from a range of 0-2 mands in baseline to a range of 0-3 mands during training. In addition, the third child increased the use of target mands from 0 in baseline to a range of 1-6 mands in training.

***Time Delay*.** In mand training, prompts are commonly used to assist learners to mand. Time delay, also called prompt delay are typically used to fade these prompts to promote independent mands. In the time delay procedure, prompts are provided to the learner after a short period of time has passed, allowing him/her to respond prior to the provision of prompts (Kittenbrink, 2015). Two time-delay methods exist: a progressive time delay and a constant time delay (Albert et al., 2012). With a progressive time delay, the amount of time between the presentation of the stimulus and the delivery of the prompt is gradually increased (Albert et al., 2012; Charlop et al., 1985). For example, the teacher first gives a demand and then provides a

prompt two seconds later. Gradually, she provides a prompt four seconds and then six seconds after giving the demand. With a constant time delay, on the other hand, the elapse of time before the provision of a prompt is fixed (O'Reilly et al., 2012). For example, a prompt is always provided 3 seconds after the demand. Vocal prompts and prompt fading are effective when teaching manding using a vocal response form (Sundberg et al., 2002).

Silbaugh et al. (2018) evaluated the effects of a lag schedule combined with progressive time delay on variability in vocal mand topographies of children with autism. The participants were two children with ASD with limited vocal mands under conditions of delayed reinforcement. The researchers used a multiple-baseline-across-behaviors design with embedded reversals. In Lag 0 conditions, participants were not required to vary their mands to access reinforcers. Reinforcers were delivered after the first instance of manding under motivation. In the Lag 1+time delay conditions, the researchers provided reinforcers for the first instance of a mand regardless of variability and then only provided reinforcers for prompted and unprompted variant mand topographies. A progressive time delay was used after the first mand. The researchers provided a 2-s time delay for the participant to vocalize a variant mand topography and if no response was emitted, an echoic prompt for a variant mand topography was provided. Then, the researchers progressively increased the length of the time delay by 2 seconds every six consecutive trials if the participant did not produce a variant mand topography. Results of the study demonstrated that a Lag 1 schedule of reinforcement with progressive timed delay could be used to increase variability of vocal mand topographies for both participants. Findings of the study provided a novel model for practitioners to use prompts and differential reinforcement to increase topographical mand variability in children with ASD.

Carbone et al. (2010) implemented a fixed time delay and vocal prompting procedures to produce vocal responses of three non-vocal participants. The three participants were a 4-year-old with autism, a 4-year-old with Down syndrome, and a 6-year-old with autism. All of them were using sign language to mand. Dependent variables were the occurrence of unprompted and prompted vocal responses that included any vocal response emitted simultaneously with the manual sign, or with a gestural/physical prompt to evoke the manual sign or after the manual sign during a 5-s time delay. Each trial started with the researcher holding an item in front of the participant to check for the presence of motivation. If there was no motivation, the researcher replaced the item. If motivation was shown but no or wrong manual signs were emitted within 5 seconds, the researcher provided a gestural prompt. If gestural prompts were not effective in evoking a sign mand, a physical prompt was provided 2 seconds later. In the time delay and vocal prompt condition, if under MO the participant signed, the research utilized a 5-s time delay instead of delivering the reinforcer immediately. When the participant emitted a sound with no sign, the abovementioned prompt sequence was used for the sign followed by a 5-s time delay. During the 5-s delay, if a vocal response was emitted, the reinforcer was delivered immediately. If no vocal sounds were made, the researcher provided a vocal prompt by saying the name of the item and waited for 2 seconds. If a vocal sound was made within 2 seconds, the reinforcer was provided, otherwise the vocal prompt was provided two more times. The reinforcer was delivered following a vocal response after any of the prompts or at the end of the sequence of the three vocal prompts. A multiple-baseline-design-across-participants was used to evaluate the effects of their intervention. Results demonstrated that all three participants had increases in vocal responses after receiving the manual sign mand training using time delay and vocal prompts. Specifically, two increased from near zero in baseline to an average of 10 and 30

prompted vocal responses respectively, and one increased from 10 in baseline to 35 unprompted vocal responses. Findings of this study showed that time delay and vocal prompting could be used with sign language to produce vocal responses in children with developmental disabilities.

Consequence Strategy.

Differential Reinforcement. Differential reinforcement is a strategy of delivering contingent reinforcement to increase occurrence of one behavior over another (Cooper et al., 2020). Given the nature of a mand, the contingent delivery of reinforcement is specific to the motivating operation (Albert et al., 2012). This is, mands have specific reinforcers that are the things or events manded for. By providing the specific items in various quantities or durations, prompted and unprompted mands are differentially reinforced. Specifically, prompted mands receive reinforcement in smaller amount (e.g., edibles) or shorter duration (e.g., iPad time). Differential reinforcement is frequently used together with extinction in mand training (Thomas et al., 2010). For example, Bourret et al. (2004) conducted vocal mand training by firstly providing reinforcement for partial utterances of mands and then gradually putting partial vocal utterance on extinction and only providing reinforcement for the utterances of whole words.

Motivating Operation. As mentioned previously, motivating operation (MO) is a type of antecedent that can serve as an independent variable to evoke behavior (Laraway et al., 2003). MO has a value-altering effect that alters the effectiveness of items as reinforcers or punishers and a behavior-altering effect that alters the frequency of behaviors related to those consequences (Laraway et al., 2003). MO plays a significant role in the development of mands during early training (Sundberg & Michael, 2001). Children are not likely to make requests for things they do not want. Therefore, mands should only be trained when an individual indicates a desire to access the relevant consequence (Drasgow et al., 1996).

To be able to teach mands, preferred items or activities must be identified and MO for the items should be captured or contrived in order to evoke a response from the learner (Iwata et al., 2000; Laraway et al., 2003; Michael, 1988, 2000). Specifically, MOs can be captured naturally in the environment or contrived purposefully through manipulating the environment (Sundberg & Michael, 2001). For example, if a child sees a preferred toy in a transparent bin with the lid locked, he could evoke behaviors to try to open it. An instructor could capture his MO and prompt the mand by saying "open", the child is motivated to say "open" to access the toy. Typically, there is no need to contrive MO for strong motivators and more attention is paid to the development of an acceptable response form under the control of the relevant MO (Sundberg, 2005). However, during mand training sessions, instructors often contrive MOs to create more opportunities for manding. For example, when the child is playing with puzzles, the instructor takes a piece and hides it to create a teaching opportunity. MO is contrived for the child to mand "puzzle piece". Manipulation of MO is usually necessary to develop mand behaviors in individuals that do not develop sufficient mand skills in the natural environment (Michael, 1988).

Halle et al. (1979) taught six teenagers with intellectual disabilities to mand for breakfast items through capturing naturally occurring MOs. The participants typically waited in line to receive their breakfast on trays. In the study, the food tray was given with a 15-s delay, and they were required to mand for each item prior to the elapsed time delay. Two participants emitted the target mands in the breakfast line and successfully generalized the skills to lunch time. The other four participants required more intensive training procedures including the delivery of a vocal model at the end of the 15-s time delay (e.g., "Tray, please"). At the end of the study, all six participants acquired and generalized their target mands.

Jennett et al. (2008) conducted a study to compare the effects of mand training and discrete trial instruction (DTI) on the acquisition of vocal mands by six children with autism following manipulation of MOs. Two concurrent multiple-probe designs across participants were conducted. To control for order effects, three participants received mand training first followed by DTI and the other three received DTI first followed by mand training. The researchers compared a child's rate of mands when an MO was present (i.e., mand training) and when it was not (i.e., DTI). During mand training, the MO was contrived for each trial by allowing participants to select from a number of toys in an opaque container, which was in view but out of reach of the participants. During DTI sessions, the researchers randomly selected toys for each trial and asked the participants "what do you want?" During both conditions, the researchers held the item in view of the participants and provided a vocal model of the target manding response (e.g., "I want crayon"). Results indicated among the three participants who received mand training first, two of them emitted more independent mands and required fewer sessions to reach criterion in the mand training condition than in the DTI condition. Among the three participants who received DTI first, all of them emitted more independent mands and needed fewer sessions to reach criterion in the mand training condition than in the DTI condition. Overall, results showed that five of the six participants emitted more independent mands and met criterion at a faster pace when the motivating operation was taken into consideration. The authors concluded that mand training is more efficient for training children with ASD to make requests.

Deprivation and Satiation. Deprivation is an establishing operation (EO) that evokes a behavior. The converse of deprivation is satiation which is an abolishing operation (AO) that suppresses behavior as it decreases the value of an item as a reinforcer (Laraway et al., 2003). Using Skinner's (1953) example to explain deprivation would be when a child has not had water

for a long time, the value of water increases and when offered water, the child is more likely to drink it. On the contrary, satiation happens when the child is offered hors d'oeuvres after he had a big dinner. The value of hors d'oeuvres decreases and he would be less interested in it (p. 147). Depending upon the state of deprivation and satiation at a certain point in time, the MO changes how much an individual wants something (Ward & Mehta, 2019).

Limiting access to preferred items outside of the mand training sessions is ideal as it creates deprivation of the items, thus increases motivation of the learner for them during mand training (Kittenbrink, 2015). In addition, to avoid fleeting MOs, instructors are encouraged to vary reinforcers by having a variety of preferred items available. Rotating the use of items is likely to prevent a specific one from satiation (Ward & Mehta, 2019). A strong MO must be present for manding to happen. Thus, it is important for instructors to closely monitor the immediate MO changes throughout a mand training session (Kittenbrink, 2015; Sundberg, 2005). As the value of an item changes over time, instructors should be able to identify changes in motivation and quickly make adjustments to the teaching procedures to make sure the learner has sufficient interest in an item to exert the effort to emit an mand (Sundberg, 2005).

In a study conducted by Davis et al. (2012), the researchers manipulated MOs to facilitate the emergence of mands in a child with autism. They first trained the participant to tact (i.e., label) items of high preference (HP) and low preference (LP). Prompts were provided and praise was delivered for correct tacts. After meeting the mastery criteria for tact training, mand test started under either deprivation or satiation conditions. A session started with the stimuli being put out of reach but visible to the participant. If he emitted a mand, access to the stimulus would be provided for 30 seconds. Access to the items would be denied if he used other forms of requests like pointing to the stimulus. During deprivation sessions, parents of the participant

were instructed to remove his HP and LP items until the mand sessions. During the satiation sessions, the participant had free access to the HP and LP items and was told, “You can do what you like”. Mand test trials were implemented prior to and after tact training sessions. A multi-element design was used to examine the differences between satiation and deprivation conditions. Results of the study showed that deprivation of the preferred items had an evocative effect on manding, and satiation had an abolishing effect. Moreover, results demonstrated the emergence of manding after a state of deprivation.

More recently, Shillingsburg et al. (2014) taught three individuals with ASD to mand for information using “who?” and “which?” under EO conditions (i.e., information needed) and under AO conditions (i.e., information not needed). An adapted alternating treatments design was used to compare the effects of mand training in EO and AO conditions on participants. During “which?” trials, nine opaque cups were placed upside down in front of the participant. A highly preferred item (e.g., Skittles) was placed under one of the cups and an empty candy wrapper (e.g., Skittles bag) was placed in sight of the participant. A trial began when the participant manded for the preferred item. In EO condition, the therapist prompted the participant by saying, “it’s under one of the cups”, contriving a situation for the participant to emit a mand using “which?”. In the AO condition, the therapist tells the location of the item by saying “it is under the orange cup”, creating a situation in which emitting the mand “which?” is inappropriate. Similarly, during “who?” trials, extra therapists joined in and a highly preferred item was given to one of them. The primary therapist placed a candy wrapper in sight of the participant. A trial began when the participant manded for the preferred item. In EO condition, the therapist prompted the participant by saying “one of the therapists has it” to contrive a situation in which emitting a mand using “who?” is appropriate. In the AO condition, the therapist says, “Brittany

has it", creating a situation where emitting the mand "who?" is not appropriate. EO and AO condition trials were interspersed in this study. During EO trials, when the participant emitted the correct mand, the therapist immediately provided the information. When the participant provided no or wrong responses, no information was provided, and the therapist continued to the next trial. During AO trials, when the participant selected the correct location or therapist, he or she was allowed access to the reinforcer. If the participant did not select a location or therapist or selected the incorrect location or therapist, no reinforcer was provided, and the therapist continued to the next trial. Results of the study indicated that all three participants were taught to mand for information using "who?" and "which?" questions exclusively under EO conditions. In addition, the researchers recommended programming both EO and AO conditions in teaching mand for information to ensure functional use of the mands.

Parent Training

Parents play a critical role in their children's development. Preliminary research has demonstrated the effectiveness of training parents to be interventionists for their children with ASD (Alpert & Kaiser, 1992; Ben Chaabane et al., 2009; Charlop-Christy & Carpenter, 2000; Hemmeter & Kaiser, 1994; Mobayed et al., 2000). Through training, parents learn to use strategies to work with their children with ASD, with a goal to develop and improve their skills and/or decrease challenging behaviors (Kasari et al., 2015). Involving parents in their children's learning offers an array of benefits for themselves and their children with ASD.

Researchers have found that when parents acquire skills to implement communication interventions, their children's behavior improves (Lang et al., 2009). For example, Siller and Sigman (2002) conducted a longitudinal study investigating effects of parental behaviors on the development of communication skills of children with autism. They studied whether parents of

children with autism who are synchronized with their children's attention and ongoing activity would result in better communication performance in their children at later ages. Twenty-five children with ASD, 18 children with developmental delay, and 18 children who were typically developing were grouped into three cohorts in the study. Early social communication scale, test of developmental abilities, and a language test were conducted. The same tests were then given at three follow-ups namely one year, 10 years and 16 years after the initial assessment. Results indicated that children whose parents were more sensitive and responsive to their attention achieved better outcomes in language skills. Children with ASD whose parents demonstrated higher levels of synchronized engagement at initial sessions developed better communication over one, 10, and 16 years than those whose parents had lower levels of synchronized engagement.

Previous research also showed that compared to therapist-implemented intervention, parent-delivered intervention yields better generalization and maintenance of skills acquired by children with autism (Koegel et al., 1982). This is not surprising as parents can provide treatment at different times and locations with their children, allowing for skill generalization. After receiving training, parents can supplement instruction when the therapist is not present, which increases the dosage of treatment the child receives; therefore, the child's gained skills are more likely to be maintained. Recognizing the barriers of obtaining autism services for families living in areas distantly located from autism training centers, Koegel et al. (2002) taught five families to use pivotal response training (PRT) procedures to target social communication of their children with autism. A total of nine children and ten parents participated in the parent education program. Parents were trained on the use of specific motivational techniques of PRT. A multiple-baseline-across-participants design was used to evaluate the effects of the program. Results

showed an increased use of PRT procedures by the parents and improvement in the children's expressive language. In addition, all children generalized the acquired communication skills to a variety of natural settings and maintained the skills at follow up session ranging from several months to a year.

Furthermore, parent training has also been found to decrease parental stress (Brookman-Frazee, 2004; Feldman & Werner, 2002) and increase quality of life for the family (Koegel et al., 1996). Raising a child with autism can be extremely stressful and emotionally taxing. There is an extensive body of literature suggesting that parents of children with autism often experience a higher level of negative psychological wellbeing in comparison to parents of children with other developmental disabilities (e.g., Abbeduto et al., 2004; Blacher & McIntyre, 2006) and parents of typically developing children (e.g., Benson & Karlof, 2009; Higgins et al., 2005). Specifically, families with children with ASD are reported to have high levels of depression (li & Brown, 2002) and stress (Hayes & Watson, 2013; Silva & Schalock, 2012). As a result of being overwhelmed by stress, parents of children with autism are more likely to be irritable and hostile toward their children, leading to negative parent-child interactions (Lovejoy et al., 2000). By receiving parent training, they acquire practical intervention skills to use with their children.

Moreover, they gain a sense of empowerment in their children's treatment, which increases their confidence in delivering interventions (li, 2014). Empowerment is a state of mind that gives a person a sense of control and authority. It is the ability to positively influence the environment through actively accessing resources, skills, and knowledge (Singh et al., 2015). Parent training is empowering as it provides them with the essential skills of delivering interventions, and parents feel they are being treated as active participants in their children's learning (Schertz & Odom, 2007). As their children's behaviors improve, parents are reinforced

by their growth, which further increases their optimism about their abilities to impact their children's development (Koegel et al., 1982). As a result, parents demonstrate lower levels of depression and stress (Scaglia, 2012). In addition, parents' leisure time increases due to their children's improvement (Scaglia, 2012). Consequently, more positive family interactions are achieved, and quality of life is increased.

Another benefit of parent training is that it reduces the financial burden for the family (Thomas et al., 2016). ASD treatments require significant costs, which are often higher than costs for other disorders (Wang & Leslie, 2010), thus parents often cannot afford all services their children need. In addition, families in rural areas have less access to quality behavioral services than those living in urban cities (Thomas et al., 2007), as clinics and professionals are clustered in big cities (Drahota et al., 2020). Through training, parents gain skills to support their children at home. Therefore, they can supplement therapist-delivered sessions without decreasing the intensity of interventions their children receive. In summary, parent training is cost-effective as it eases the financial burden for the family.

These findings from parent training literature have important social significance. When parents are reinforced by their children learning new skills, they also increase confidence in themselves helping their children learn more (Schertz & Odom, 2007). Additionally, parents and children had more meaningful and positive interactions with one another, making them more likely to continue to maintain and generalize newly acquired skills (Nefdt et al., 2010).

Behavioral Skills Training

Behavioral skills training (BST) is an evidence-based, effective protocol to teach new skills and train individuals to implement intervention plans (Hsieh et al., 2011; Stewart et al., 2007). The BST package is a multi-component intervention that consists of instructions,

modeling, rehearsal, and feedback. Specifically, it involves (a) clear and explicit instructions (written or verbal) for the target behavior; (b) modeling or demonstration of the target skill or procedure, (c) role-play to practice the target skill or procedure, and (d) feedback on the performance that occurred during rehearsal (Miltenberger, 2004).

BST has been used to successfully teach a range of behavioral skills including abduction-prevention skills (Gunby et al., 2010), firearm jury prevention skills (Miltenberger, 2008), and poison consuming prevention skills (Dancho et al., 2008). In addition, it is one of the most effective training packages for instructing new staff (Fetherston & Sturmey, 2014). For example, Lavie and Sturmey (2002) used BST to teach three teaching assistants to conduct paired-choice stimulus preference assessments. All three participants acquired the skills in about 80 minutes. Sarokoff and Sturmey (2004) used BST to teach three special education teachers to conduct discrete trials and all three showed rapid and large improvements from baseline to post-training interventions. In addition, Nigro-Bruzzi and Sturmey (2010) used BST to train three special education teachers and three speech therapists to teach mands to six children with ASD, and staff performance increased after the training.

BST has been used to teach parents to implement procedures with their children with autism and has demonstrated success (Hassan et al., 2018; Stewart et al., 2007). Harriage et al. (2016) used BST to train parents to implement most-to-least prompting procedures to teach their children with autism pedestrian safety skills in the community. Data were collected on the implementation of in-situ pedestrian training by the parents as well as the independently performed safety skills by their children with autism. A multiple-baseline-design-across-participants was used to evaluate performance of the parents and their children with autism. Results of the study indicated that BST was successful in helping parents employ the most-to-

least prompting procedures and implement the in-situ pedestrian safety skills intervention. Furthermore, all participants with autism had significantly improved safety skills during intervention with one child participant maintaining the acquired skills at the 1-month follow-up phase.

Loughrey et al. (2014) used BST to train two caregivers to conduct mand training procedures with their children. One was diagnosed with autism and the other was diagnosed with fragile X syndrome. The two caregivers were trained to conduct eight procedures including preference assessments, delivering preferred items, capturing and contriving motivating operations, conducting probes to assess mand repertoire, errorless prompting procedures, vocal shaping, collecting data, and correcting errors. Using a concurrent multiple-baseline-across-modules design, the researchers analyzed the effects of the BST module training with each caregiver. During the instruction process, the participants were provided with written instructions followed by verbal instructions on how to conduct the eight procedures. The researchers then used video modeling depicting graduate students implementing the skills and provided in-vivo models in real-time. After the modeling, caregivers rehearsed the skills and received immediate feedback on their performance. After the training, caregivers utilized the eight procedures to teach their children manding. Data were collected on the frequency of children's spontaneous (i.e., independent mands without prompts) and prompted mands (i.e., mands evoked after adult prompting). Results indicated that all three caregivers had a significant improvement from close to zero percent accuracy in baseline to over 80% accuracy in training. In addition, both children evoked more spontaneous mands than prompted mands at the end of the study, suggesting that children can make requests more independently. This study demonstrated the effects of BST on

teaching caregivers to correctly implement procedures of teaching mands to children with developmental disabilities.

Asian Immigrant Families

According to the most recent U.S. Census in 2010, Asian population was the fastest-growing ethnic group in the United States between 2000 and 2010. It is estimated that by the year of 2050, the Asian American population will make up 9.3% of the U.S. population with 37.6 million individuals (U.S. Census Bureau, 2010). Approximately 5.6% of the general population in the U.S. identifies as Asian, and Chinese is the largest detailed Asian group (U.S. Census Bureau, 2010). About 70% the Asian-origin population reported being foreign-born and constituted around 25% of the nation's total foreign-born population (U.S. Census Bureau, 2010). Despite this large and increasing population, there has been limited attention on special needs education and services for children from Asian immigrant families (Wang & Casillas, 2012).

Research showed that ethnicity status does not influence the prevalence of ASD (Palmer et al., 2005). In addition, the Autism Society of America (2000) claims that "autism…knows no racial, ethnic, or social boundaries; family income, lifestyle, and educational levels do not affect the chance of autism's occurrences" (p. 3). Although autism prevalence is similar across different ethnicities, when compared to their White counterparts, children from Asian immigrant backgrounds receive appropriate interventions at a later age (Mandell et al., 2002) and have less access to educational services (Thomas et al., 2007). The underutilization of educational and intervention services of Asian immigrant families is multifaceted involving various barriers to access services and lack of engagement in autism research studies.

Barriers to Access Intervention Services. There is evidence suggesting that autism is recognized and interpreted differently in Asian and Western cultures (Kim et al., 2020). Many Asian parents may view autism as a mark of shame (Shorey et al., 2020), and try not to disclose their child's diagnosis (Kang-Yi et al., 2018). As a result, parents may be less likely to seek services, participate in their child's educational process, and engage in interventions (Tincani et al., 2009). On the other hand, teachers' lack of cultural competency can contribute significantly to the low service use as well (Lau et al., 2004). Due to the fact that the majority of teachers serving students with ASD are Caucasians (Morrier & Hess, 2012), there may be a lack of understanding in teachers regarding social and cultural variations of their students (Tek & Landa, 2012).

In addition to cultural challenges, language barriers also play an important role in limiting access to special education services for children with ASD from Asian immigrant backgrounds (Broder-Fingert et al., 2013). Since caregivers act as young children's initial gatekeepers for services (Thomas et al., 2007), their lack of English proficiency may create a gap between professionals and themselves, which may lead to their unwillingness to communicate with professionals and participate in their children's interventions. According to Rogers-Adkinson et al. (2003), many Asian parents engage in less interactional communication with providers, hence, may receive less informed treatments for their children.

Non-English-speaking Asian immigrants often have difficulties finding service providers fluent in their native languages who can help them obtain diagnostic and intervention services (Nguyen et al., 2016). Since there is little research available on bilingualism in children with ASD, providers struggle to develop informed language recommendations for these children (Drysdale et al., 2015). Consequently, families are helpless in seeking information on

bilingualism for their child with ASD, which hinders their child's access to appropriate interventions. Language problems also exist in assessment tools and communication equipment. In addition, limited ASD screening tools are linguistically sensitive (Morrier et al., 2008), and are provided in both English and the child's native language. For example, many children with speech deficits use augmentative and alternative communication (AAC) devices to help them communicate (Mirenda, 2003). However, for parents whose primary language is not English, incorporating their native language into their child's AAC device can be challenging. Moreover, there is little literature to guide professionals to select or adapt AAC system to meet these needs (Tincani et al., 2009). Immigrant families' lack of English proficiency to fully use the AAC devices potentially affects their child's use of intervention services.

Additionally, there is a dearth of resources in the community for immigrant children with ASD (Mandell & Palmer, 2005). Immigrant families may have less knowledge on the educational and healthcare system which may hinder their abilities to navigate the autism service system (Shorey et al., 2020). Additionally, parents from disadvantaged backgrounds often have limited social connections with service providers who can provide them with important information on treatments and ways to obtain them for their children with ASD. Magaña et al. (2013) found that middle-class Caucasian families are more likely to have access to the Internet, books, new technologies, and other resources to explore alternative treatments or pay for specialty clinicians. In summary, it is challenging for Asian immigrant families to access the same or similar interventions and resources due to cultural and language barriers, reduced social networks, and limited culturally sensitive services.

Lack of Research on Asian Immigrants. Despite Asians being the proportionally fastest-growing ethnic group in the U.S., Asian immigrants with children with disabilities are not

well-represented in existing research literature (Kim et al., 2020). Most of the research in special education and applied behavior analysis are conducted with populations that are predominantly of Anglo origins with limited involvement of individuals with autism from other cultures (Dyches et al., 2004). In addition, Asians have been reported to use less mental health services, compared to the general population (Abe-Kim et al., 2007) and one major reason is that services are not culturally responsive (Sue et al., 2009). As a result, professionals struggle to ensure the quality and appropriateness of services provided to their Asian clients. Therefore, more culturally responsive research and mental health services are pressingly needed by Asian immigrants (Hall & Yee, 2012). Moreover, limited research studies have been done on bilingualism in children with ASD to help professionals develop language recommendations for these children (Dyches et al., 2004). Such limitations reflect a lack of multicultural awareness (Wilder et al., 2001) and compromise the quality of special education services for children with ASD from Asian immigrant families (Dyches et al., 2004).

Although parent training is a well-established practice involving children with autism, there is a gap in literature of how this approach works for ethnic minority populations (Bjørknes et al., 2012). According to Lau (2006), less involvement of ethnic minority families is the most well-documented disparity in parent training. Comparing to White parents of the host country, ethnic minority parents represent lower recruitment rates and higher dropout rates in parent training programs (Cunningham et al., 2000; Kazdin & Whitley, 2003; Orrell-Valente et al., 1999; Reid et al., 2001). Since the link between parental involvement and positive child outcome is considered more complex in ethnic minority groups (Dishion & Patterson, 2006), without enough research evidence, dissemination of parent training is questionable to Asian immigrant families, as they hold different perspectives on family functioning and childrearing. For example,

some Asian parents believe that children may stop working hard if they praise them too much (Heine et al., 2001), so they favor criticism instead (Lau, 2012). They may disagree to ignore challenging behaviors because of the potential fear of losing face (Lau et al., 2010). Therefore, more research in this field is needed to build in elements to address cultural incongruence of parent training in Asian immigrant families.

Summary

This chapter provided an overview of the literature that is relevant to providing parent training on mand training for children with autism. It stressed the importance of mand training as an intervention for children with autism, explained the benefits of involving parents in providing mand training, and described the approach (BST) used to train the parents by the researcher. It also emphasized the necessity and significance of recruiting Asian immigrant parents as research participants.

In the above-mentioned studies, many of them focused on parent-implemented mand training. Interestingly, they reported children's outcomes as a result of parent training with a focus on measuring the children's mand frequency (i.e., how many times a mand is emitted with or without prompt; Ben Chaabane et al., 2009) rather than the number of mand acquisition (i.e., how many independent mands acquired). This can be problematic because a child can mand for one item frequently yet has a small mand repertoire that prevents him or her from manding for a variety of preferred items. In addition, regardless of teaching procedures, no research on parent training or parent education on mand training were conducted specifically with Asian immigrant parents of children with ASD. The current study aimed to fill the gap in the existing literature and incorporate these variables together by providing parent training to Asian immigrant parents

and measure mand acquisition of their children with ASD. The following chapter presents the research methodology used in this study.

Chapter III

Methodology

This chapter describes the participants, settings, materials, research design, data collection procedures, investigation procedures, interobserver agreement, treatment fidelity and social validity of the present study. These elements were used to answer the research questions of the study:

1. To what extent will Asian immigrant parents in the United States be trained through BST to implement mand training procedures with their children with ASD?
2. To what extent will the child participants' mand acquisition be impacted by the parent-implemented mand training?

Participants

Eligibility of Participants

Parent Participants. This study consists of two participant groups-parent participants and child participants. The primary participants of the present study are parents of children with autism. They were recruited based on the following criteria: (1) are first-generation immigrants from an Asian country with at least elementary schooling completed in home countries, (2) reside in the United States during the course of the study, (3) have a child aged between six and 12 with a diagnosis of ASD, (4) have no previous experience of mand training, and (5) speak basic English.

Child Participants. Secondary participants of the present study are children of the parent participants. Child participants were recruited based on the following criteria: (1) have an official diagnosis of ASD, (b) are between six to 12 years old, (3) have limited manding skills based on the *Verbal Behavior Milestones Assessment and Placement Program* (VB-MAPP; Sundberg,

2007), demonstrated by missing skills in level 1 in the mand domain on the milestone scoring form, and (4) have some echoic skills based on the VB-MAPP assessment, demonstrated by skills in level 1 in the echoic domain on the milestone scoring form.

Characteristics of Participants and Settings

All three parent-child dyads lived in a city in an eastern U.S. state during the course of the present study. The study took place in the participants' home settings. All phases of the study were conducted in a quiet room in each family's house. Sessions were videotaped with the permission of all participants.

Parent-Child Dyad 1: Mia and Neal. The first parent-child dyad was Mia and Neal. They were originally from Thailand. Mia obtained her bachelor's degree in Thailand. The family came to the United States a year before the study occurred to obtain better educational and intervention services for Neal. They lived in a rural area in an eastern U.S. state. The family spoke Thai at home and both Mia and Neal could speak basic English. Both parents worked part-time. They had two children-Neal and his younger sister who was typically developing.

Neal was a 10-year-old boy and was diagnosed with autism at the age of three in Thailand. He attended a public special school from Monday to Friday and received direct ABA services for six hours per week at a local autism support clinic. Neal received a VB-MAPP assessment at the clinic he attended approximately four months prior to the current study. Based on his assessment, Neal met three milestones on level 1 of the echoic domain, indicating that his echoic skills were within the developmental range of birth to 18 months. Neal met two milestones in level 1 in the mand domain, indicating that his mand skills were at the developmental range of birth to 18 months. Neal typically manded for desired items by gesturing, pointing and making eye contact. The majority of Neal's mands were multiply

controlled by an MO and the presence of desired items, as well as prompts from others. Before participating in the study, he was able to mand with echoic prompts for “candy”, “cucumber”, and “bubbles”. He only had one unprompted mand which was “bathroom” in Thai when he needed to use the bathroom. Neal demonstrated high frequency of low intensive challenging behaviors including hitting, licking, and self-injurious behaviors such as head hits and head presses.

Sessions were conducted at the dining table in the dining room in their house where the family ate and worked with the children. Mia and Neal were seated across the table facing each other. The researcher sat next to Mia at the table. Toys and edibles were put away from the instructional area and were not easily accessible.

Parent-Child Dyad 2: Yan and Julia. The second parent-child dyad was Yan and Julia. They lived in a rural area in an eastern U.S. state. Yan was originally from China and came to the United States for her master’s degree. The primary spoken language in the household was Chinese. The father, Yan’s husband, worked overseas during the course of the study. Yan was the main caregiver of Julia and worked part-time. The family had three children-Julia and her two older brothers who were both typically developing.

Julia was a 6-year-old girl diagnosed with autism at age four. She was born in the United States and attended a self-contained classroom in a public school. She received in-home service with a therapeutic support staff (TSS) for 10 hours per week. Julia received her VB-MAPP assessment from school six months prior to the onset of the current study. Based on assessment data, Julia met the full criteria for all five milestones in level 1 and one milestone in level 2 in the echoic domain. This indicated that Julia’s echoic skills were around the developmental age of 18 months. Julia met three milestones in level 1 in the mand domain, indicating that Julia’s mand

skills were at the developmental range of birth to 18 months. Julia manded for desired items by grabbing and pointing. She often yelled “mine!” when wanting to grab something. If desired items were not obtained, Julia would whine. She also had difficulty giving up desired items such as toys in her possession.

Sessions were conducted at the table in the dining room in their house. Yan and Julia were seated across from each other and the researcher sat next to Yan at the table. It was the same setting used for Julia’s sessions with her TSS. Books and toys were placed on a shelf at the other side of the room.

Parent-Child Dyad 3: Zoe and Taylor. The third parent-child dyad was Zoe and Taylor. They lived in a city in an eastern U.S. state. Zoe was originally from China. She obtained her bachelor’s degree in her home country and immigrated to the United States in her adulthood. Chinese was the spoken language in the house. Zoe’s husband worked full time and Zoe worked part-time. Taylor was the only child in the family. His grandparents were also prominent in his life and took turns to come to his house to provide additional care for Taylor.

Taylor was a 12-year-old boy and was diagnosed with autism at the age of three in China. He was born there and came to the U.S. when he was six years old. He attended a private special school and received in-home service for 10 hours per week with his TSS. Because the researcher did not have access to Taylor’s language assessments from his school, the researcher conducted a VB-MAPP assessment with Taylor in his house with a focus on the mand and echoic domains. Results revealed that Taylor met three milestones in level 1 of echoic and one milestone in level 1 of mand, indicating that Taylor’s echoic and mand skills were at the developmental range of birth to 18 months. Taylor generally had trouble manding for preferred items. When wanting something, he would simply grab it or yell “truck” or “mommy” repeatedly until the item was

provided. Although Taylor could emit independent mands, he had a limited mand repertoire. His independent mands observed before the study were “fish”, “truck”, and “mommy”.

Taylor demonstrated high frequency of aggressive behaviors in the form of scratching and pinching others on their arms, hands, and faces. Zoe shared with the researcher that he tended to exhibit aggressive behaviors when others including herself were near him. If he felt that someone invaded his personal space, he would warn them by raising his hand up and if they did not step back, he would scratch. Zoe also reported that two arms’ length was a safe distance. Taylor also exhibited self-injurious behavior in the form of hitting his forehead with a closed fist.

Sessions were conducted at a desk in Taylor’s room and Zoe sat in a chair facing Taylor across the desk. Sometimes sessions were conducted with Zoe and Taylor sitting on the floor next to the desk. The researcher sat 3-5 feet away from them. Toys and other reinforcing items were stored in a locked closet at the other side of his room.

Materials

Reinforcing items including edibles and toys were identified through preference assessments (described in the Procedures section below) and were used in all phases. Identified reinforcers were brought in by the researcher each time she went to the participant’s house. Parents also limited access to the same reinforcers available at their houses. A GoPro camera on a tripod was used to record sessions. Task analysis forms and flow chart forms were provided to the parent participants.

Measures

The Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP)

Based on B.F. Skinner’s (1957) analysis of verbal behavior, *the Verbal Behavior Milestones Assessment and Placement Program* (VB-MAPP) was developed as an assessment

tool, curriculum guide, and skill system for children with ASD (Sundberg, 2008). According to its manual, the VB-MAPP consists of five components: milestones assessment, barriers assessment, transition assessment, task analysis and skills tracking, and placement and IEP goals (Sundberg, 2008). The VB-MAPP milestones assessment is commonly used to provide a relative measure of an individual's verbal repertoire and related skills (Dixon et al., 2015). It contains 170 milestones across three developmental levels and assesses 16 different verbal operants and related skills (Sundberg, 2008). Language and learning milestones are sequenced according to typical development and are separated into three levels: level 1 is birth to 18 months, level 2 is 18 to 30 months, and level 3 is 30 to 48 months. The Milestones Assessment is designed to provide a representation of the learner's existing verbal and related skills. By assessing skill development across these milestones, more effective and appropriate instructional objectives can be identified.

In the current study, the VB-MAPP assessment served as a tool for determining the eligibility of potential child participants. In addition to the mand domain, skills in the echoic domain were also assessed. The rationale for this decision was that the type of prompt for vocal mands is typically echoic prompts, therefore, the child participants need to have some echoic skills to be able to participate in the vocal mand training. Based on their scorings in the mand and echoic domains, only children with at least level 1 echoic skills and whose manding skills were at or below level 1 were qualified to participate in the current study. According to the descriptions in the VB-MAPP milestones assessment, individuals whose echoic skills are within level 1 can correctly repeat 2-25 sounds and syllables said to them. Individuals whose manding skills are within level 1 are able to emit 2-10 mands without prompt across two people and two settings.

Preference Assessment

A preference assessment is conducted to identify a learner's preferred items and their relative order of values (Cooper et al., 2020). Technically, it is done by presenting a large pool of items systematically to the learner to identify preference (Cooper et al., 2020). Specifically, there are three types of preference assessments: asking about the preferences, conducting free operant observation, and conducting trial-based assessments.

Asking about the Preferences. Potential reinforcers can be identified by asking the learner or their significant others (e.g., parents, siblings, teachers). Depending on the learner's language ability, the assessment administer can ask the learner directly what he/she likes. Open-ended questions, and questions in choice or rank order formats can be used. In addition, pictures, icons, or real items can be used for learners with limited language skills (Cooper et al., 2020). Significant others of the learner can also be interviewed to provide information about preferred items of the learner.

Free Operant Observation. Free operant observation can be conducted when the learner is given opportunity to choose items freely from his/her environment. The administer observes the learner and records the duration of time the learner engages with each item. The longer the duration, the stronger the value of the item. The advantage of free operant assessment is that it gives the learner sufficient time to move around and explore the environment and to experience each of the item (Cooper et al., 2020). However, only using this method to identify preferred items can sometimes result in the learner picking one item and playing with it for the entire observation, which provides little information on the relative ranking of preferred items (Roane et al., 1998).

Trial-Based Assessments. The use of trial-based methods allows the administer to present items to the learner in a series of trials (Cooper et al., 2020). A variety of trial-based procedures have been proposed including single stimulus (Pace et al., 1985), paired stimulus (Fisher et al., 1992), multiple stimulus with replacement (Fisher et al., 1992), and multiple stimulus without replacement (DeLeon & Iwata, 1996). Preferred items are labeled as high preference, medium preference, and low preference based on predetermined criteria (Cooper et al., 2020). For example, items chosen 80% or more of the trials are high preference and they are more likely to serve as reinforcers.

Single Stimulus. The single stimulus method, also called a successive choice, is conducted by presenting one item at a time and recording the learner's reaction to it (Pace et al., 1985). Responses such as approach or escape are noted and duration of the time spent with an item is also recorded. A single stimulus method is chosen when the learner has difficulty with scanning and selecting among two or more items (Hagopian et al., 2001).

Paired Stimulus. The paired stimulus preference assessment is also called the forced choice method (Cooper et al., 2020). Two items are presented simultaneously for the learner to choose from and each item is paired with all other items in the set (Fisher et al., 1992). The administer records the learner's choice in each trial. Based on the number of times chosen, items are ranked as high, medium and low preference. DeLeon and Iwata (1996) argued that stimuli identified as preferred using paired stimulus may not be identified as preferred using free operant observation. That is, items identified based on this method may not function as reinforcers.

Multiple Stimulus with Replacement. In multiple stimulus with replacement (MSW), the learner chooses a stimulus from an array of three or more items and in the following trial the chosen item remains while the rest will be replaced with new things (Fisher et al., 1992). The

entire sequence is typically repeated for several times (Carr et al., 2000). This method has been proven to be as effective as paired stimulus, and less time-consuming (Hagopian et al., 2001).

Multiple Stimulus without Replacement. In multiple stimulus without replacement (MSWO), the learner chooses a stimulus from an array of three or more items and in the following trial the item chosen is removed while the rest of the items remain (DeLeon & Iwata, 1996). The difference between MSWO and MSW is that in MSWO, the item chosen does not return to the array in the following trial. This method has been proven reliable in identifying reinforcers (DeLeon & Iwata, 1996). In addition, it is more time efficient as it only takes half of the time to conduct than the MSW method (DeLeon & Iwata, 1996). In summary, the MSWO approach is accurate and efficient (Higbee et al., 2000).

The identification and use of strong reinforcers are critical for effective behavior changes in children with autism (Wolfe, 2018). In mand training, conducting preference assessment helps protect against fleeting and weak motivation for items (Kittenbrink, 2015). The current study used a two-step approach to conduct preference assessments. A MSWO approach was used after parent interviews. Conducting parent interviews first helped the researcher identify preferred items across visual, auditory, edible, tactile, and social domains (Fisher et al., 1996). Since the researcher did not work with the child participants prior to the current study, parent interviews allowed the researcher to quickly narrow down categories of preferred items to be used in the subsequent MSWO assessment which was chosen here due to its accuracy and efficiency in identifying preferred items. In addition, using a combination of preference assessment methods provides an extra layer of assurance that the identified items can serve as reliable reinforcers during mand training (Kittenbrink, 2015). The results of the preference assessment of the current study are outlined in the Procedures section.

Research Design

A concurrent multiple-baseline-across-participants design (Baer et al., 1968) was used to evaluate the effects of parent training on parent participants' implementation of the task analysis and the effects of the parent-delivered mand training on the acquisition of unprompted mands of the child participants. A multiple-baseline-across-participants design is an experimental design in which the intervention is applied to the same behavior, in the same setting, to different individuals (Cooper et al., 2020). The use of this design allowed the researcher to demonstrate the effectiveness of a treatment with more than one subject who displays a similar need for behavior change without withdrawing the treatment. By introducing the intervention phases in a staggered fashion, the effects can be replicated in a way that demonstrates experimental control (Byiers et al., 2012). It is appropriate for evaluating effectiveness of a treatment with irreversible changes in behavior (Horner & Baer, 1978).

Each parent-child dyad had baseline, intervention, maintenance and generalization phases. All three dyads were introduced to baseline conditions at the same time. Upon having a visually stable baseline or a baseline with a decreasing trend, the baseline phase ended for the first dyad, and parent training started with those participants only. A visually stable baseline was defined as a line with scores within 10% of variability. The first parent received individual parent training while the other two participants remained in baseline. Subsequent parent participants received parent training in a staggered fashion. All phases took place in each parent participant's house respectively.

Independent Variable

The independent variable of the study was the parent training package delivered through BST on mand training. Parents were taught to use the task analysis form (Figure 1) to implement

the mand training. Their fidelity of implementation was also measured using the form. The BST procedures of parent training were outlined in the Procedures section below. The task analysis incorporated three elements of mand training: echoic prompts, differential reinforcement, and time delay.

Echoic Prompts. Parents were trained to use echoic prompts to facilitate manding of the child participants. Specifically, if child participant showed interest in an item and the correct mand was not emitted after 2 seconds, the parent participant would provide an echoic prompt by saying the name of the item. For example, if a child participant demonstrated interest in an M&M candy, the parent participant would wait for 2 s for the child to correctly mand "M&M". When the child gives no or wrong response, the parent participant would prompt the child by saying "M&M".

Differential Reinforcement. Parents were taught to use differential reinforcement to promote unprompted manding of their children. Unprompted mands typically receive reinforcement in larger amount or longer duration. When the child correctly emitted an unprompted mand, the parent would give him/her the requested item more in quantity or longer in duration. When the child emitted a prompted mand following an echoic prompt, the parent would give him/her the requested item less in quantity or shorter in duration. For example, if the child emitted a prompted mand for M&M, the parent would deliver one piece of M&M; if the child emitted an unprompted mand for M&M, the parent would deliver two or more pieces of M&Ms to differentially reinforce the unprompted mands.

Time Delay. In addition, parents were trained to use the time delay procedures to fade prompt and promote independent manding of their children. Typically, a few seconds were added before the provision of a vocal prompt to promote an independent response. Therefore,

stimulus control was transferred from the prompted to the unprompted condition. Parents were taught to conduct error correction procedures when the child participants failed to correctly emit an unprompted or prompted mand after a 2-s time delay. There were two steps to conduct error correction, parents would first remove the item and her attention (i.e., not providing eye contact) for two to three seconds and then re-present the item with an immediate echoic prompt (i.e., saying the name of the item).

Figure 1

Mand Training Task Analysis Form

Item: Learner: Date:	Trial 1			Trial 2			Trial 3			Trial 4			Trial 5		
Steps	**Y**	**N**	**N/A**	**Y**	**N**	**N/A**	**Y**	**N**	**N/A**	**Y**	**N**	**N/A**	**Y**	**N**	**N/A**
1. Hold preferred item (edible or toy) within the child's view but out of reach and identify when motivation is present (child looks at or reaches for item)															
2. Wait for 2 s for the child to request															
3. A. Deliver if child requests (a **large** piece of edible or **15-20** s access to toy) and say the name of the item-trial finished															
3. B. If child gives no or wrong response, remove item and attention for 2-3 seconds and represent item while saying the name of item															
4. A. Deliver if child repeats the name of the item (a **small** piece of edible or **5-10** s access of toy) and say the name of the item															
5. Represent the item and wait for 2 s for the child to request															
6. A. Deliver if child requests (a **large** piece of edible or **15-20** s access to toy) and say the name of the item-trial finished															
6. B. If child gives no or wrong response, remove item and attention for 2-3 seconds and represent item while saying the name of item															
7. A. Deliver if child repeats the name of the item (a **small** piece of edible or **5-10** s access of toy) and say the name of the item-trial finished															
7. B. End trial if child gives no or wrong response															
4. B. If child gives no or wrong response, remove item and attention for 2-3 seconds and represent item while saying the name of item															
5. A. Deliver if child repeats the name of the item (a **small** piece of edible or **5-10** s access of toy) and say the name of the item-trial finished															
5. B. End trial if child gives no or wrong response															

Dependent Variables

Primary Dependent Variable. The primary dependent variable was the percentage of steps completed correctly by the parent participants on the mand training task analysis form (Figure 1). Parents were trained to implement the steps of the task analysis to provide mand training. It was created based on the mand training procedures developed by the Pennsylvania Training and Technical Assistance Network (PaTTAN, n.d.).

Secondary Dependent Variable. The secondary dependent variable was the percentage of unprompted mands emitted by the child participants in a session. Unprompted mands are independent mands, which were defined as when the child participants oriented towards the parent participants and made vocal response articulations without prompts from the parent participants for the preferred item. Unprompted mands did not include grabbing, gesturing or pointing to the item. Unprompted mands did not include repeating the name of the item, such as "M&M, M&M, M&M". Adding words or phrases to the name of the item was accepted as unprompted mands if the specific item was identified, such as "M&M, please", or "I want M&M". Mands emitted in either Thai or Chinese were accepted with the confirmation of the parent participants. The child participants' response form was vocal mand which was defined as, given that the item was in sight, the child would vocally request the item. The mand type was mand for present items. The child would request a desired item he saw in the possession of the parent participants.

Data Collection

Data Collection of Parent Performance

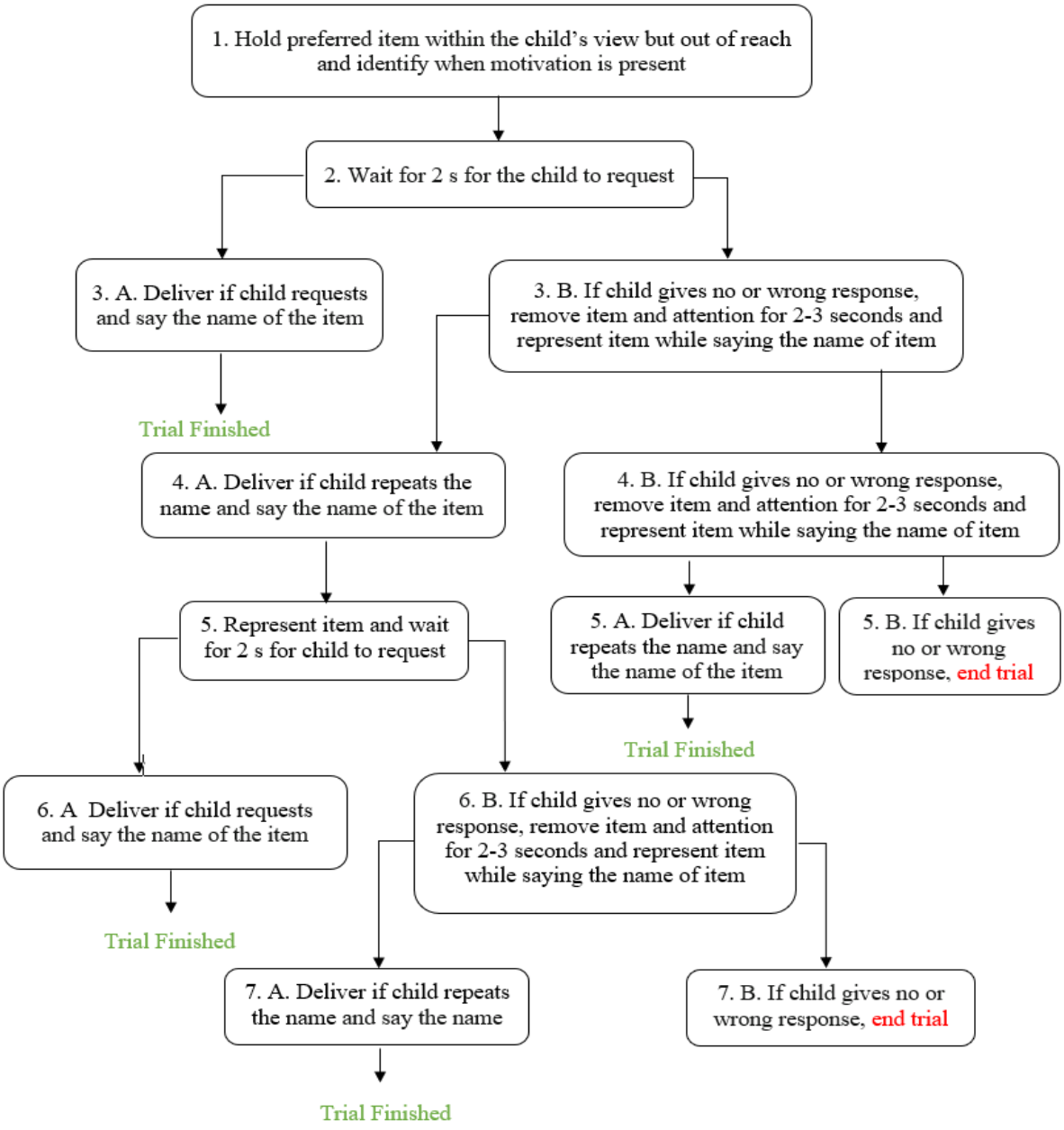
Parent performance was scored using the mand training task analysis form (Figure 1). The flow chart (Figure 2) served as a companion to the task analysis form. Each step was

outlined in the form. Each run-through of the task analysis (i.e., from initiation till completion) was defined as a trial. The presentation of reinforcing items marked the onset of each trial. The percentage of correct steps was calculated by dividing the number of correctly completed steps in a trial by the total number of applicable steps within that trial and multiplying by 100.

For each manding trial, only certain steps of the task analysis were applicable contingent on the child participant's response. For example, when the parent initiated a trial by checking for the presence of motivating operation (MO) of items shown to the child, and under MO the child manded, then this trial was finished and only steps 1-3A were applicable for data collection. Contingent upon no or wrong responses from the child, 3A would be considered a non-applicable step and the parent would continue the task analysis from step 3B. Depending on where the child gave no or wrong responses, there were a total of six possible conditions. Each condition consisted of different number of applicable steps (written out below). No weights were used for any of the steps and percentages of the trials were calculated in the same way for all conditions. A "Y" was marked if the parent implemented a step as instructed in the task analysis. An "N" was marked if the parent missed a step or failed to implement a step as instructed in the task analysis. Non-applicable steps were marked as "N/A" and were not included in the calculation. The task analysis form was used to record parent's performance during baseline, parent training, intervention, maintenance, and generalization phases.

Figure 2

Flow Chart of Mand Training Steps



Data Collection of Child Performance

Child performance was determined by recording the occurrence of unprompted mands emitted by child participants on the mand probe sheet (Appendix A). Mand targets were selected based on MO of the child at the moment. MO were closely monitored and followed throughout the sessions. To maintain a strong MO for each identified preferred item, parents avoided using one item for consecutive trials. However, if the child had a strong MO for a particular item, that item was used for several trials in a row. Several targets were taught alternately based on the MO until five trials had been run for each target. Mands were recorded on a trial-by-trial basis. Data on unprompted mands were collected only on the first mand opportunity of each trial, which was step 3A on the task analysis form. Unprompted mands emitted in the prompt fading procedures within the trial (i.e., step 6) were excluded from data collection. For each session consisting of five trials, the child could emit unprompted mands between zero to five times. The mastery criterion of mand acquisition of an item is 80% or higher of unprompted mands within a session. That is, when a child participant independently manded for at least four out of five trials for an item in one session, that item is considered acquired. As mentioned previously, data were collected on the occurrence of unprompted mands emitted by the child participants using frequency count.

Possible Conditions of Correct Implementation of the Task Analysis

When implementing the task analysis, contingent on the steps the child made errors on, there were six possible conditions of correct parental implementation of the task analysis. Below is a description of the steps in each condition. These six possible conditions are in line with steps shown in the flow chart.

Condition 1. Step 1: The parent held two to three preferred items within the child's view but out of their reach and identify if MO was present for any of the items. If the child looked at, pointed to or tried to reach for one of the items then the parent used that item to teach and removed the other items. If no MO was demonstrated for any of the items, then the parent switched to different items to identify MO.

Step 2: When the child showed MO for an item, the parent held the item for 2 seconds for the child to mand for it.

Step 3A: If the child emitted a correct mand for the item, the parent immediately delivered the item-a large piece if an edible, or 15-20 seconds of access if a toy. The parent said the name of the item while delivering it.

Condition 2. Steps 1-2: Same as condition 1.

Step 3B: If the child gave no or wrong response that did not approximate the adult form of the name of the item. The parent ran error correction procedures.

Step 4A: If the child repeated the name, the parent immediately delivered the item, a small piece if an edible, or 5-10 seconds of access if a toy. The parent said the name of the item while delivering it.

Step 5: The parent re-presented the item and waited for 2 seconds for the child to mand for it.

Step 6A: If the child emitted a correct mand for the item, the parent immediately delivered the item-a large piece if an edible, or 15-20 seconds of access if a toy. The parent said the name of the item while delivering it.

Condition 3. Steps 1-5: Same as condition 2.

Step 6B: If the child gave no or wrong response that did not approximate the adult form of the name of the item. The parent ran error correction procedures. (Second error correction).

Step 7A: If the child emitted a correct mand for the item, the parent immediately delivered the item-a large piece if an edible, or 15-20 seconds of access if a toy. The parent said the name of the item while delivering it.

Condition 4. Steps 1-6B: Same as condition 3.

Step 7 B: If the child gave no or wrong response that did not approximate the adult form of the name of the item, end trial.

Condition 5. Steps 1-3B: Same as condition 2.

Step 4B: If the child gave no or wrong response that did not approximate the adult form of the name of the item, the parent ran error correction procedures. (second error correction).

Step 5A: If the child emitted a correct mand for the item, the parent immediately delivered the item-a large piece if an edible, or 15-20 of seconds access if a toy. The parent said the name of the item while delivering it.

Condition 6. Steps 1-4B: Same as condition 5.

Step 5B: If the child gave no or wrong response that did not approximate the adult form of the name of the item, end trial.

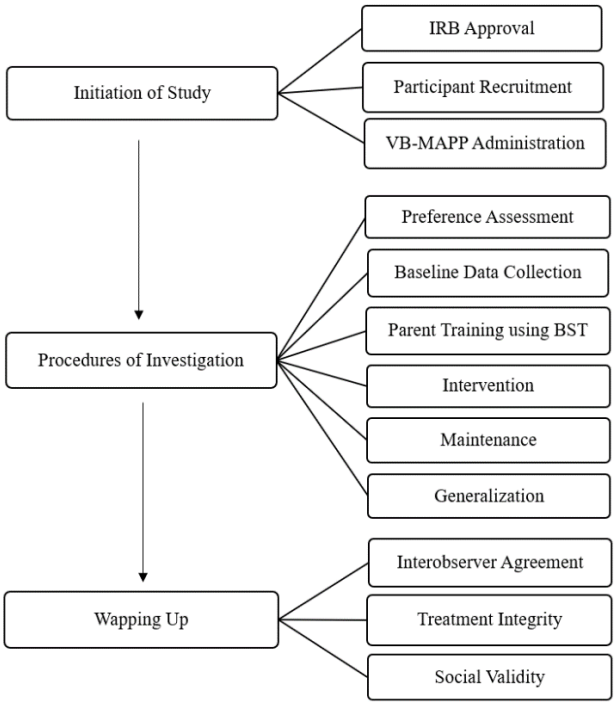
Procedures

Figure 3 presents the procedures of the current study. It consists of three main stages: initiation of the study, investigation, and wrapping up. Specifically, in the first stage, once IRB approval was obtained, participant recruitment started. The VB-MAPP assessment was conducted on the 3rd child whose assessment results were not accessible to the researcher to

determine eligibility of participation. Then the second stage began with preference assessments, which were completed to identify each child participant's preferred items to be used as reinforcers in the current study. Baseline phases started concurrently for all three dyads. Parent training was offered by the researcher after the baseline. Intervention phases followed. Maintenance and generalization were conducted four weeks after the intervention. Interobserver agreement, treatment integrity and social validity were measured in the last stage.

Figure 3

Flow Chart of Procedures of the Current Study



Participant Recruitment

Following approval of the Institutional Review Board (IRB), the researcher reached out to schools and agencies in the immediate geographic area of the researcher. The researcher contacted directors/coordinators of special education programs in local school districts, representatives of autistic support agencies and directors of parent support organizations via

email and phone call to introduce the study and the criteria for family participation. An IRB-approved invitation letter containing the researcher's contact information was sent to each contact.

Five families contacted the researcher and expressed interests in the study. One family was immediately eliminated due to failure to meet the inclusion criteria for parent participants. Despite the mother being an Asian immigrant, she was out of the country during participant recruitment. The father was not an Asian immigrant and he was the main caregiver of his child with ASD, therefore this family was excluded. Another family was also eliminated after one preliminary observation and interview of the child in their house. The child demonstrated strong manding skills that exceeded the level of skills pre-set for the current study thus did not meet the inclusion criteria. The remaining three families met the criteria for primary and secondary participants and were invited to participate in the study.

Preference Assessment

Prior to the initiation of the study, a preference assessment was conducted using a two-step process. First, parent participants were interviewed regarding their children's most preferred edibles and toys. Then, a multiple stimulus preference assessment without replacement (MSWO; DeLeon & Iwata, 1996) was conducted using items identified from the parent interviews for each child participant using the following steps. To create deprivation of MO, child participants were only allowed access to the identified items during research sessions of the study.

MSWO Preference Assessment Steps:

1. Have eight items ready and make sure edibles and toys are not mixed in one round.
2. Present each item in isolation and state its name.
3. Present the items on a tray and instruct the child to pick one.

4. Record the item selected first on the preference assessment form (Appendix B).

5. Allow a few seconds for the child to interact with the toy or consume the edible.

6. Remove the selected item and place it in an empty bin and rearrange the positions of the remaining items.

7. Repeat steps 3-6 until all items are selected or the child shows no interests in the remaining items.

The first three items selected from the eight items are considered as items of high preference. Steps 1-7 were then repeated four more times using eight different items each time for every child participant. The rationale for doing five rounds was to identify a plenty of preferred items so if the child participants have no or weak MO for some of the items during a session, the researcher has other items to use. Among the 40 items presented in the five rounds of the preference assessment, a total of 15 items (see Table 1) were identified for each child participant and were used throughout the study as mand targets and reinforcers.

Table 1

Highly Preferred Items Identified from Preference Assessments

Child Participants	Highly Preferred Items	
	Edibles	Toys
Neal	Frito Chocolate Smarty Caramel Dorito Cookie Cheeto Coconut (Candy) Airhead	Putty Harmonica Bubble Guitar String (Spray) Drum
Julia	Ice Cream Cracker Dorito Cookie Chip Mochi	Harmonica Magnet Gone Fishing Cymbals Guitar Putty Monster Truck Flute Bubble
Taylor	Banana Rice Cracker Chip Oreo Skittle Grape	Puzzle Piece Block Monster Truck Tube Phone (Toy) Tank Ball (Sphere Toy) Lego Fire Truck

Baseline Phase: Parent-Implemented Mand Training before Receiving Training

A copy of the mand training task analysis form (Figure 1) was provided for the parent participants to review. Each step of the task analysis was briefly explained. A corresponding flow chart of the task analysis (Figure 2) was also provided as a visual support. Parent participants were allowed to refer to both materials while working with the child participants. Identified preferred items were available for the parents to use as teaching targets and

reinforcers. The researcher instructed the parents to follow the steps to the best of their abilities to teach their children to ask for a preferred item. Each parent's performance was observed and recorded on the task analysis form by the researcher. Child participant's performance was also recorded on the mand probe sheet.

A trial started with parent checking for MO. If there was no MO, "No MO" was circled and the trial ended. If there was MO, "MO" was circled, and the trial continued. If the child emitted an unprompted mand for the item, "Y" would be circled. If there was MO but the child did not respond or emitted a wrong mand, "N" would be circled. If MO for an item was strong, parent would continue using that item for the next few trials. If MO for an item was weak, parent can choose to present a different item. Each item was presented for five times all together. At minimum, ten trials (i.e., two sessions) were conducted. More trials were conducted as needed until a visually stable baseline was established. During baseline, the researcher did not participate in the activity nor provided any feedback.

Training Parents Using BST

After a visually stable baseline was established, the researcher delivered mand training procedures to parents using BST. The parent training was administered using the four steps of BST, which were instruction, modeling, rehearsal, and feedback. Specifically, a PowerPoint presentation was used at the beginning. Handouts consisting of the presentation slides were provided, so that parents could refer to them as written instructions. Topics included in the presentation were: definition of mand, importance of mand training for children with autism, basic mand teaching procedures, definition of reinforcers, and the use of differential reinforcement. Each step on the task analysis form was explained in detail. Pre-recorded videos of the researcher and an assistant performing the mand training task analysis steps were played at

the end of the presentation. Following the video modeling, the researcher modeled the mand training steps in person with the parent participant acting as the "target child". Then, the parent rehearsed the steps with the researcher where parent implemented the steps and the researcher acted as the child. The researcher purposefully made errors at different steps while the parent was teaching, so that parents were trained to correct various errors by closely following the steps listed in the task analysis. Questions and concerns were addressed, and immediate verbal feedback was given throughout the training. In order to move from the parent training phase to the intervention phase, parent participants were required to meet the mastery criterion which was 100% accuracy of implementation of the task analysis for three consecutive times. Table 2 depicts the duration of training for each parent participant.

Table 2

Duration of Training for Each Parent Participant

Parent participants	Duration of the parent training using BST	Duration of instruction	Duration of modeling	Duration of rehearsal and feedback
Mia	106 minutes	42 minutes	30 minutes	34 minutes
Yan	85 Minutes	20 minutes	25 minutes	40 minutes
Zoe	99 minutes	39 minutes	20 minutes	40 minutes

Second Parent Training for Zoe. During the intervention phase, parent participants' fidelity of implementing the task analysis was closely monitored to ensure that they implemented the steps as described. When the percentage of correctly implemented steps in the task analysis was below 80% for two consecutive sessions, the intervention phase was paused, and the researcher provided parent training for the second time. In this study, Zoe and Taylor was the only parent-child dyad that required a second parent training. The second parent training differed from the first one in two areas. First, the second parent training only involved modeling,

rehearsal, and feedback of the BST and the instruction step was omitted. Second, child participant was engaged in the second parent training. Instead of modeling and rehearsing between the researcher and the parent participant, the researcher modeled the procedures for the parent with the child and the parent rehearsed the procedures with their child while the researcher provided feedback. The duration of the second parent training for Zoe and Taylor was 80 minutes.

Intervention Phase: Parent-Implemented Mand Training after Receiving Training

Upon completing the parent training and demonstrating competency, parent participants implemented mand training trials to their children. This process was the same as that was described in the baseline phase, so it was not repeated here. The intervention phase for Zoe and Taylor resumed after Zoe re-met the mastery criterion which was 100% accuracy for three consecutive times. Under the condition of consistent accuracy above 80%, intervention ended when the child participants mastered two mand target items or 10 sessions have been run, whichever came first.

Maintenance

Two weeks after the completion of the intervention phase, two sessions were conducted to assess the maintenance of skills of the parent and child participants. All procedures and settings in this phase were the same as those implemented in previous phases. Due to holidays and family schedules, Zoe and Taylor's maintenance sessions were conducted about four weeks after the completion of their intervention phase.

Generalization

Generalization of the parents' teaching and children's manding skills were assessed on the same day following the completion of the maintenance phase. In the generalization phase, the

mand type was changed from mand for present tangible items to mand for actions to assess if the parent participants could use the task analysis to teach the child participants to mand for preferred actions and if the child participants could emit independent mands for preferred actions. For example, when wanting to be picked up, the child would say “pick up”, or when wanting to be pushed on a swing, the child would mand for the parent to “push”. All procedures and settings in this phase were the same as those described in previous phases. Depending on the child participant’s MO, one to three sessions (or five to 15 trials) were conducted in the generalization phase.

Mand targets in this phase were selected based on parents’ suggestions and children’s motivation at that moment. For Neal, it was to vocally say “play” for Mia to play the “Finger Family” song in Thai on YouTube on the iPad at the table. Mia played the video of the song for a few seconds and paused it and if Neal manded “play”, then Mia hit the play icon to honor the mand and deliver the reinforcer (the song). For Julia, the mand target was to say “throw” when playing with a ball with Yan standing next to the table. The ball was a small, inflated light-weight vinyl playball. Yan and Julia played by throwing and catching the ball back and forth. Yan would pause and wait for Julia to mand “throw” before she threw the ball to Julia. For Taylor, the mand target was also “throw” when playing with a small cloth bean bag with Zoe in his room. The procedure was the same as that of Yan and Julia.

Interobserver Agreement

A second observer was trained to collect interobserver agreement (IOA) and treatment integrity data of this study. The second observer was a doctoral student in Special Education and a Board Certified Behavior Analyst (BCBA). The researcher first explained to the second observer how the study and data collection scoring forms work and then they reviewed and

recorded two video clips of the study together and addressed disagreements on scoring. Upon achieving 100% agreement on both training videos, IOA was calculated for 35% of the data across all investigation phases for Mia and Neal. Specifically, it consisted of 1 session (consisting of 5 trials) in baseline, two sessions in intervention, 1 session in maintenance, and 1 session in generalization. IOA was calculated for 33% of the sessions across all phases for Yan and Julia. Specifically, it consisted of 1 session in baseline, two sessions in intervention, 1 session in maintenance, and 1 session in generalization. IOA was calculated for 30% of the data across all investigation phases for Zoe and Taylor. Specifically, it consisted of 1 session in baseline, 1 session in intervention, 1 session in maintenance, and 1 session in generalization. All sessions were randomly selected.

The second observer scored each applicable task analysis step in a trial and compared them with the scorings of the researcher. Then a step-by-step method was used to calculate IOA by dividing the number of agreements by the total number of agreements and disagreements and multiplying by 100 (Cooper et al., 2020). The mean of each investigation phase was then calculated. IOA scores were also calculated for the number of unprompted mands emitted by the child participants using sessions selected for IOA for the parent participants. The second observer scored step 3A of the task analysis of a trial and compared it with that of the researcher. All five trials were compared individually, and a trial-by-trial method was used to calculate IOA for the session by dividing the number of agreements by the total number of agreements and disagreements and multiplying by 100. Results of interobserver agreement were presented in chapter 4 below.

Treatment Integrity

Treatment integrity refers to the extent to which the independent variable is carried out as described (Cooper et al., 2020). A treatment integrity checklist (Appendix C) containing six sections was developed to measure the researcher's fidelity of implementing each phase of the study, including baseline, parent training, intervention, second parent training, maintenance, and generalization. The parent training section included the components of behavioral skills training such as providing instruction, modeling the correct responses, allowing the parent participants to rehearse the skills, and providing feedback.

Treatment integrity data were calculated for 35% of the data across all investigation phases for Mia, 33% of the data across all investigation phases for Yan, and 30% of the data across all investigation phases for Zoe. The second observer reviewed recordings of trials and coded the checklist items as "Y" for observed, "N" for not observed and "N/A" for non-applicable. Results of treatment integrity were presented in chapter 4 below.

Social Validity

Social validity was introduced by Wolf (1978) as a way to assess the goals, procedures and effects of a study and as a function of the contingencies of the applied research field. Specifically, social validity has three dimensions. It can be used to evaluate the social significance of the research goals, the social appropriateness of the treatment procedures, and the social importance of the effects of the treatment (Wolf, 1978). Social validity is critical when seeking to bridge the gap between research and practice. Without social validation, interventions are less likely to be adopted in practice (Leko, 2014). In addition, practitioners are more likely to use viable treatments that are user friendly (Van Houten, 1979; Wolf, 1978).

A social validity questionnaire (Appendix D) containing five 5-point Likert Scale questions was developed by the researcher to evaluate parent participants' perspectives on the parent training process, the mand training procedures, and their children's outcomes. Parents answered each question by selecting a number between 1=*strongly disagree* and 5=*strongly agree*. The questionnaire was uploaded to the SurveyMonkey website and the link was sent to each parent participant following completion of the study. Participants' responses to the questions were anonymous. Results of the questionnaire were also presented in chapter 4.

Data Analysis

The present study aimed to answer the following research questions:

1. To what extent will Asian immigrant parents in the United States be trained through BST to implement mand training procedures with their children with ASD?

2. To what extent will the child participants' mand acquisition be impacted by the parent-implemented mand training?

To answer the first research question regarding parent performance, the researcher calculated the percentage of steps implemented correctly on the task analysis form by the parent participants during each phase of the study. Visual analysis was used to answer this question. In order to show the variability of data and have a higher internal validity, data of the parental performance were presented by trial, instead of by session. The x-axis represented trials and the y-axis represented percentage of correctly implemented steps of the task analysis.

The second research question was answered by reporting the percentage of unprompted mands emitted by the child participants after receiving parent-delivered mand training. The number of mands acquired was also reported. A visual analysis was created across the three child participants. Unlike the parent participants, data of the child participants were presented by

session. The x-axis represented sessions and the y-axis represented percentage of unprompted mands emitted in a session. Visual analysis was conducted based on observed changes in trend, level, and variability. Trend refers to the overall direction taken by the data points, level refers to the average rate of performance during a phase, and variability refers to the extent to which measures of behavior yield different outcomes within and across phases (Byiers et al., 2012; Cooper et al., 2020).

Chapter IV

Results

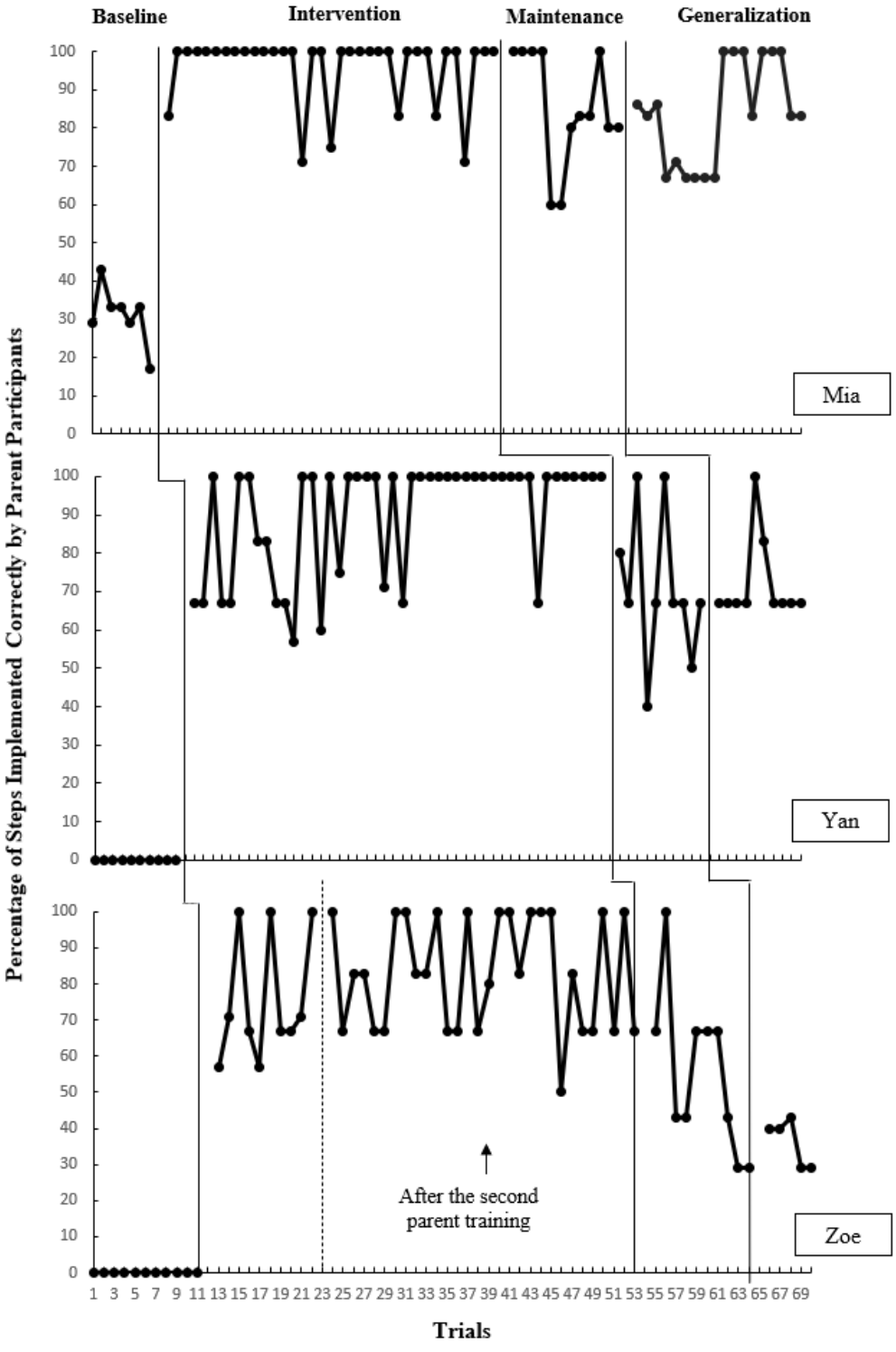
This chapter presents data collected on the three parent participants and the three child participants. Visual analyses of the graphed dependent variables are presented. The interobserver agreement and treatment integrity data denote believability of the results. Social validity data from parent participants are reported.

Results of the Parent Participants

Figure 4 displays the percentage of steps implemented correctly per trial across parent participants across baseline, intervention, maintenance, and generalization phases. For single subject research, a visual analysis of the graphed information can determine if the independent variable has an effect on the dependent variable (Cooper et al., 2020). A visual analysis of Figure 4 shows that parent training using BST had a positive effect on the performance of parents in implementing mand training procedures. Experimental control was shown by the improvement in parents' performance from baseline to intervention across all three parent participants. All three parents maintained their learned skills at various levels and two of them demonstrated high levels of generalization. Although Zoe had a decreasing trend in her generalization phase, when compared to baseline she still demonstrated generalization.

Figure 4

Percentage of Steps Implemented Correctly by Parent Participants



Mia

During baseline, Mia demonstrated a low level of accuracy in implementing the steps as measured by the task analysis form. Mia's average performance of this phase was 31% accuracy with a range of 17%-43%. When a clear decreasing trend was evident, parent training was first offered to Mia while Yan and Zoe remained in baseline. After being introduced to intervention, Mia demonstrated an immediate and substantial increase in her performance. After one trial of 83% accuracy, she reached 100% accuracy. During the intervention phase, she demonstrated an average of 96% accuracy and an increasing trend (range=71%-100%), compared to her performance in baseline.

Mia was also assessed in maintenance phase for 12 trials two weeks after the intervention and had an average performance of 85.5% accuracy with a range of 60%-100%. Although there was some variability, her overall performance was strong. She implemented the steps with an accuracy rate equal to or above 80% in 10 out of the 12 trials. Then Mia was assessed for generalization for 18 trials after the maintenance phase. Her performance in generalization (M=83.89%) was slightly lower than that in the maintenance phase but was still fairly strong with six trials reaching 100% accuracy. Mia's performance in the beginning of the generalization phase was similar to that at the end of the maintenance phase. As Mia progressed through the generalization phase, she demonstrated an increasing trend in correct implementation of the steps.

Yan

Yan demonstrated 0% accuracy in implementing the steps throughout her baseline phase. When introduced to the intervention, she demonstrated an immediate increase in level (M=90.54%) and an increasing trend (baseline range=0%-0%, intervention range=57%-100%).

She quickly obtained 100% accuracy after two trials. There was variability in her performance in the first half of the intervention phase, but it stabilized toward the latter half of this phase at 100% except in one trial.

Yan was assessed for skill maintenance for 10 trials two weeks after the intervention and had an average accuracy of 70.5% with a range of 40%-100%. Yan's performance demonstrated a large range of variability in this phase, but she was able to obtain 100% accuracy in two out of 10 trials. Additionally, Yan participated in the generalization phase for 10 trials. The overall level of her performance in the generalization phase (M=72%) was slightly higher than the level of responding observed in the maintenance phase and she reached 100% accuracy in one trial.

Zoe

Zoe demonstrated 0% accuracy throughout the baseline phase. Data indicated an immediate and significant increase when introduced to intervention after she received training. The average percentage increased from 0% in baseline to 73% in intervention with a range of 57%-100%. Zoe displayed 100% accuracy for three out of 10 trials in this phase.

Although she demonstrated great improvement comparing to her performance in baseline, since her accuracy of implementing the task analysis steps was below 80% for two sessions, she was offered parent training for a second time to increase her fidelity of implementing the procedures. After reaching mastery criterion in the second parent training, she returned to intervention and her average accuracy increased to 83% (range: 50%-100). She was able to demonstrate 100% accuracy in 12 out of 30 trials in the second period of her intervention phase (after the second parent training). Zoe's performance in the first intervention period was close to 80% (M=74%) and she consistently made the same mistakes (i.e., delivering reinforcer to Taylor without saying the name of the reinforcer and making mistakes in the error correction

procedures). Therefore, it was easy to increase her procedural fidelity once she corrected her errors after the second training.

Zoe participated in the maintenance phase for 10 trials four weeks after her intervention phase and had an overall performance of 53% accuracy with a range of 29%-100%. Her performance demonstrated high variability and after one trial with 100% accuracy in the second trial, she demonstrated an overall decreasing trend throughout this phase. Even with the decreasing trend, performance was still better than that in the baseline. Zoe was assessed on her generalization of learned skills for 10 trials. She had an average accuracy level of 36% with a range of 29%-43%. Despite the decreased percentage of accurate implementation in generalization, she still did better in this phase than in baseline.

Results of the Child Participants

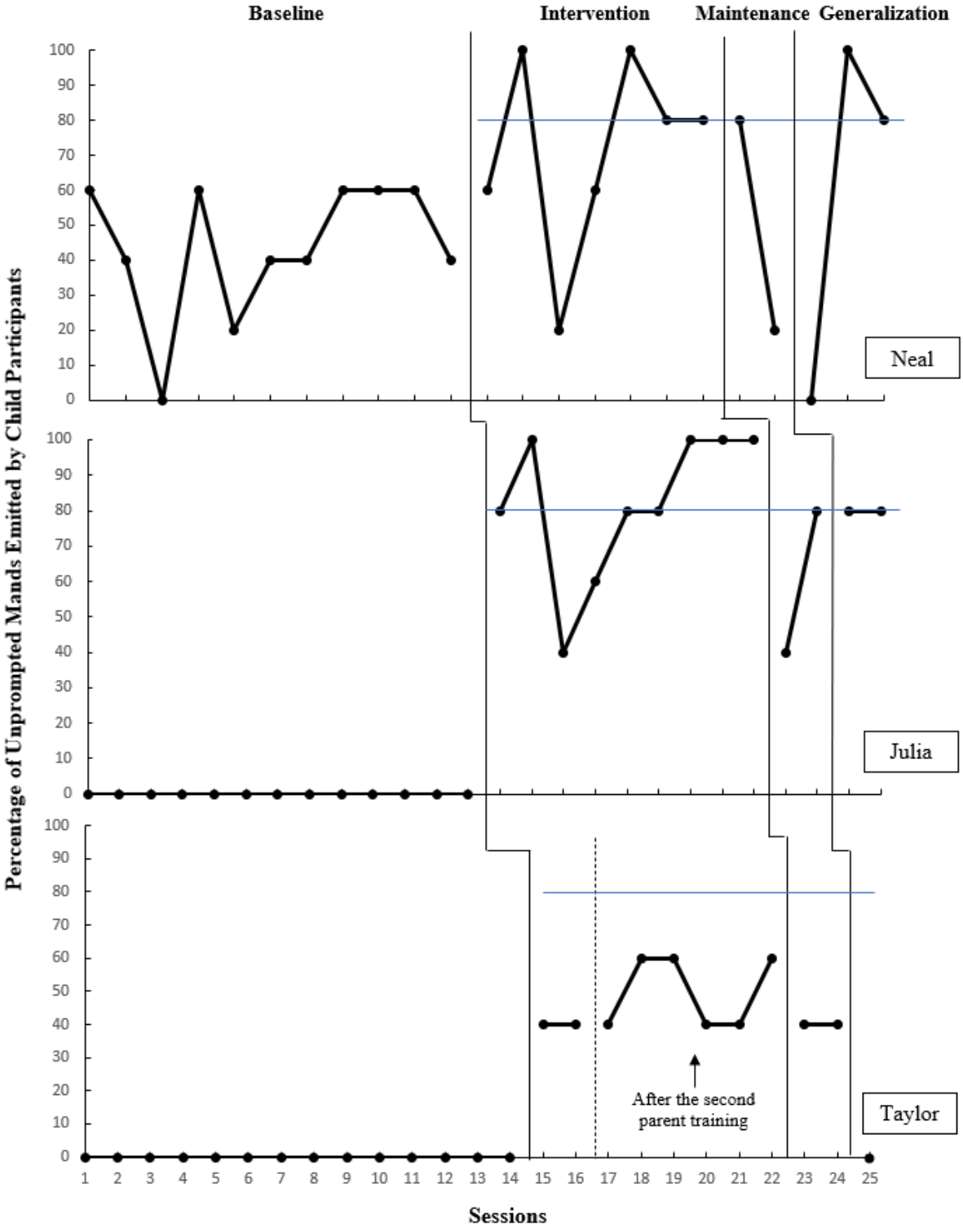
Figure 5 presents the child participants' percentage of unprompted mands emitted in each session across phases. The x-axis represents sessions (each session consists of 5 trials). The y-axis represents percentage of unprompted mands. Mastery criterion was 80% of unprompted mands in one session. That is, if the child independently manded four times or more for one item within one session, the item manded for was considered acquired. Dashed doglegged lines represent changes from one phase to the next. On the panel for Taylor, a dotted vertical line within the intervention phase separates intervention data collected after the first and second parent training.

Parent performance had direct positive effects on the child's manding skills and acquisition. Experimental control was shown by the increases in the percentage of unprompted mands emitted from baseline to intervention by all three child participants. The first two child participants acquired new mands in the intervention phase and demonstrated maintenance and

generalization of the manding skills. Although Taylor's performance was not ideal, and failed to meet mastery criteria in any phase, his unprompted manding behavior still improved, when compared to his baseline phase. Each child's performance was presented below.

Figure 5

Percentage of Unprompted Mands Emitted by the Child Participants



Note. The horizontal lines denote the mastery criterion level of 80%.

Neal

The top graph of Figure 5 displays Neal's manding performance in terms of the percentage of unprompted mands across phases. In baseline, before Mia was trained, Neal demonstrated low levels of unprompted mands. The average percentage of unprompted mand occurred during this phase was 44% with a range of 0% to 60%. There were five sessions where he had unprompted mands for 60% of the session; however, in baseline, he never reached mastery criterion which was 80%. Upon receiving mand training delivered by Mia, Neal's unprompted manding behavior increased in the intervention phase and his average percentage of unprompted mands was 71.4% with a range of 20%-100%. His performance reached mastery criterion in four sessions, of which two were 100%. He acquired two unprompted mands: Frito and Smarty (Table 3). He was able to mand for these two items with little to no prompts. Frito was used to assess his level of maintenance of the acquired items in the intervention phase. Two sessions were conducted, and he emitted unprompted mands for Frito for 80% of the first session, indicating that he maintained the skills. For the second maintenance session, he emitted unprompted mands for 10% of the session. Neal was assessed for generalization for three sessions, and he demonstrated criterion performance in two of them. It showed that he could generalize his manding skills from manding for present tangible items to manding for actions (i.e., play).

Julia

Throughout baseline, Julia did not emit any unprompted mands. When introduced to intervention, her performance had an immediate jump from 0% in baseline to an average of 82% in intervention (range: 40%-100%). She reached mastery criterion for seven out of the nine sessions, among which, she had 100% in four sessions. During this phase, she acquired four

unprompted mands: mochi, flute, guitar, and cracker (Table 3). She was assessed for maintenance for two sessions and demonstrated criterion performance in one and mastered "chip", indicating that she maintained her manding skills of mand for present items. She was also assessed for generalization of her manding skills for two sessions and demonstrated criterion performance in both sessions, suggesting skill generalization from manding for present items to manding for actions (i.e., throw).

Taylor

Throughout baseline, Taylor did not emit any unprompted mands. After being introduced to intervention, his performance increased to an average of 40% of unprompted mands. Following the second parent training, the percentage of unprompted mands increased from 40% to 50% (range: 40%-60%). However, he never reached mastery criterion during the intervention phase. Maintenance data were collected four weeks after intervention for two sessions. Data indicated a stable performance at 40% in both sessions. Taylor was assessed for generalization for one session and emitted zero unprompted mand. The target in this phase was for him to mand "throw" for Zoe to throw a ball to him. The nonexistence of unprompted mands may be in part due to the weak MO for playing ball with Zoe. Results showed no evidence of generalization of his manding skills from manding for present items to manding for actions. Overall, Taylor demonstrated a low level of responding with zero session meeting the mastery criterion (80%). However, comparing to his performance in baseline, he had sessions where he emitted unprompted mands for 60% of the session in intervention, which meant that he manded independently for three out of the five trials in that session.

Table 3

Child Participants' Acquired Mands

Child Participant	Acquired Mand Items
Neal	Frito, Smarty
Julia	Mochi, Flute, Guitar, and Cracker
Taylor	None

Interobserver Agreement

The average IOA for Mia was 99% with a range of 97%-100%. The average IOA for Yan was 99% with a range of 95%-100%. The IOA for Zoe was 100%. Table 4 lists all IOA data for the parent participants. The IOA was 100% for all three child participants (see Table 5).

Table 4

Interobserver Agreement Results of the Parent Participants

Parent Participant	IOA	Baseline	Intervention	Maintenance	Generalization
Mia	99%	97%	100%	100%	100%
Yan	99%	100%	95%	100%	100%
Zoe	100%	100%	100%	100%	100%

Table 5

Interobserver Agreement Results of the Child Participants

Child Participant	IOA	Baseline	Intervention	Maintenance	Generalization
Neal	100%	100%	100%	100%	100%
Julia	100%	100%	100%	100%	100%
Taylor	100%	100%	100%	100%	100%

Treatment Integrity

Treatment integrity for dyad 1 was 99% with a range of 95%-100%. The 95% score was based on the researcher's performance in Mia's baseline phase where the researcher failed to adhere to the fourth item on the Treatment Integrity Checklist (Appendix C) in the baseline section- "Do not provide verbal interactions with the participants". Treatment integrity for dyad 2 was 99% with a range of 95%-100%. The 95% score was based on the researcher's performance in Yan's intervention phase where the researcher failed to adhere to the second item on the checklist in the intervention section- "Do not provide verbal interactions with the participants". Treatment integrity for dyad 3 was 100%.

Social Validity

A social validity questionnaire (Appendix D) containing five questions was completed by each parent participant on SurveyMonkey.com following their last sessions. All three parents rated the five questions with the highest rating of "5" on the questionnaire indicating a high level of social validity of the present study. All parents reported enjoying the training and considered the training meaningful. The survey results suggested that they were satisfied with the outcomes of their children and would continue to use the procedures with their children. Parent participants also shared with the researcher their thoughts on the study. Mia reported that she continued using the steps to teach Neal manding after the study was completed and found it helpful. Throughout the investigation, Zoe expressed interests for the researcher to train the TSS of Taylor, so the TSS could also learn about mand training and use the procedures with Taylor.

Chapter V

Discussion

This chapter summarizes and discusses the results of the present study. Specifically, it begins with the summary of the results. Then it presents a discussion of possible explanations of the different levels of performances of the parent and child participants. Findings of the study are presented with regard to previous literature. Limitations of the study are discussed. Additionally, recommendations for future research and implications for practice are provided and discussed with specific regard to working with Asian immigrant families.

Summary of Results

The overall results of the study indicated that parent training delivered using behavioral skills training (BST) was effective in teaching parents of Asian immigrant backgrounds the procedures of mand training. There was an immediate significant increase in the percentage of steps implemented correctly following training in all three parent participants, with no overlapping data between the baseline and intervention phases. All three parent participants demonstrated different levels of maintenance and generalization of their learned skills. In addition, the parent-delivered mand training was effective in increasing mand acquisition of their children with autism, exhibited by the increased percentage of unprompted mands emitted upon receiving training from their parents. All three child participants demonstrated continued responding, with two demonstrating criterion performance, in phases following the intervention.

Parental Attitudes and Their Procedural Fidelity

Parent training was effective for all three parent participants to implement mand training procedures with their children. However, the level of effectiveness for each parent was different. Specifically, Mia’s performance had a substantial increase from baseline to intervention. After

one trial, she reached 100% accuracy and demonstrated stable responding throughout the intervention. It is worth noting that Mia's accuracy in baseline was higher than that of the other two parent participants. One possible reason was that Mia studied the task analysis and practiced the steps with her husband outside of the investigation sessions with the researcher. This allowed her to be more familiar with and fluent in implementing the steps. Another reason was that she stayed close to the task analysis steps, and when she missed a step or completed a step incorrectly, she still tried to follow the next steps. This led to a higher fidelity of implementing the task analysis, resulting in an average score of 31% in her baseline. Mia continued her high level of performance to her maintenance and generalization phases.

Similarly, Yan's procedural fidelity increased from zero in baseline to 100% accuracy in the intervention phase. A major reason for her low accuracy in baseline was her nonadherence to the task analysis steps. When instructed to teach Julia to ask for something, Yan kept asking "what is it, say its name" when Julia tried to grab a desired item. If Julia did not give a response, Yan repeated "tell me what this is called" without providing a prompt. A trial often ended with Julia being frustrated and losing interest in the item. If Julia responded correctly, instead of providing the item as a reinforcer, Yan often required Julia to ask for the item again, which caused a delay in reinforcement delivery. She sometimes increased the response effort for Julia. For example, when Julia manded for a bite of ice cream in a bowl, instead of delivering the bite, Yan added a follow-up question "tell mommy what color this ice cream is". This often ended with Julia trying to grab the bowl without responding to the question. Upon bringing these issues to Yan's attention and addressing them in parent training sessions, she started following the steps and became better at providing prompts and delivering reinforcers. As a result, her performance increased drastically.

The substantial increase of Zoe's percentage of accurate step implementation from baseline to intervention supported the effectiveness of parent training on her performance. During baseline, Zoe had zero percent of correct implementation which resulted from her failing to follow the task analysis. Specifically, when presenting an item for Taylor to mand and he did not respond, instead of providing an echoic prompt, Zoe immediately switched to a different item. Another common mistake observed was that when Taylor emitted a prompted mand, Zoe did not provide another opportunity for him to mand independently, which was listed as a step in the task analysis.

This finding is consistent with previous research that procedural fidelity is significantly related to interventionist's attitude and openness to experience (Peters-Scheffer et al., 2013). That is, when the parents provide interventions with a more positive, open attitude, they tend to have a higher procedural fidelity. Eslinger et al. (2020) also reported that more positive attitudes toward evidence-based practices promote procedural fidelity. In addition, previous research found that interventionists who had higher enthusiasm, and preparedness and beliefs about the effectiveness of the program were found to influence implementation quality and sustainability (Klimes-Dougan et al., 2009).

Child Performance in Line with Parental Procedural Fidelity

It was interesting to find that not only was the child participants' performance positively impacted by the parent-delivered training, but the level of their responding generally aligned with the level of accuracy of task analysis implementation of the parent participants. As shown in Figures 4 and 5, in baseline phases, when the parents had lower levels of accuracy of implementation, their children also had lower percentage of unprompted mands. Specifically, Mia had an average score of 31% and Neal had a 44%. While Yan and Zoe both had zero percent

accuracy in baseline phases, their children Julia and Taylor both had zero percent occurrence of unprompted mands in baseline. In the intervention phases, when the three parent participants' accuracy level increased, all three child participants' percentage of unprompted mands also increased.

Among the three parents, Zoe had the lowest accuracy in intervention, and correspondingly, Taylor also emitted the least unprompted mands among the three child participants. Similarly, Mia and Yan maintained and generalized their teaching skills and so did their children Neal and Julia with their manding skills. Zoe had a lower level of performance in the maintenance and generalization phrases and Taylor also performed lower in those two phases. This finding was consistent with previous findings that as parents increased their fidelity of implementing mand procedures, their children increased their abilities to use mands (Kaiser et al., 2000). This is not surprising because when the parents can implement the procedures with high fidelity, it means that they can administer mand training steps accurately, provide reinforcement accordingly, and use error correction procedures as needed. Consequently, their children receiving the high quality mand training can learn the skills better.

The children's progress in turn functions as reinforcement for their parents and encourages the parents to deliver training with higher level of accuracy. Parents' fidelity and child performance were transactional that affect each other in a reciprocal manner (Coleman, 2018). When the child makes quick progress after receiving training from their parents, parents are reinforced and motivated to perform better with their training. On the contrary, when the child does not make adequate progress, parents feel discouraged and have less confidence in their teaching (Schertz & Odom, 2007). Among the three dyads, Zoe and Taylor had the lowest level of performance in both the parent and child participant groups. In generalization phase,

Taylor showed a weak MO for the activity and exhibited challenging behaviors in sessions, and Zoe struggled to implement the procedures as described. Overall, Taylor had a low level of responding to Zoe's teaching and Zoe demonstrated a low level of expectation of Taylor's participation in and achievement from this investigation.

This observation might be due to the fact that Taylor is older (12 years old) and have a more significant deficit in vocal communicating, compared to the other two child participants. Seltzer et al. (2000) reviewed research on families of adolescents and adults with autism and reported that adolescence is normally a time of increased independence for children, and for many families who have children with autism at this stage realize that their children's level of functioning may not have significant change in the future. This may exacerbate family relationship for parents and their adolescents with autism. According to Zheng et al. (2016), the longer parents cared for their children with disabilities, the more negative their attitudes are, thus the more negative influence on their quality of caregiving. This may be a variable that led to the lower performance of Zoe. Future research can investigate the relationship between child's age and severity of the disability and parent's attitude of receiving training.

The observed high variability of the parents' performance might have been due to the various levels of difficulty of the conditions of the task analysis implementation. As mentioned above in chapter 3, based on the child's responding, applicable steps of each trial vary, ranging from as few as three steps to as many as seven steps. In total, six conditions are possible with each one containing different numbers of steps. When the child emitted an unprompted mand at the very beginning, only three steps were applicable-the parent only needed to provide reinforcement with no need to run error correction procedures. In contrast, if the child kept giving no or wrong responses, the parent would use error correction procedures, which created

more chances for making mistakes. Depending on how the child responded, much variability of parent performance was observed.

The high variability within phases in the three child participants was probably due to two reasons. Firstly, the child's MO of the item used in a trial was not closely monitored and followed by the parent participants. Parents were trained to keep the preferred items novel and of high value by rotating them frequently. However, sometimes an item was used repeatedly for several trials, resulting in the child losing interest in the items and hence not emitting mands to obtain them. This was particularly true for Neal and Julia. When they had strong MOs for an item, they emitted mands to obtain it and hence had a higher percentage of unprompted mands. In contrast, when they had weak MOs for an item, they emitted fewer mands to obtain the item and hence had a lower percentage of unprompted mands. Secondly, when the parent participant did not implement the steps with fidelity, the child participant was less likely to emit a correct mand, leading to a low level of responding. Apart from weak MO, there was another contributing factor to Taylor's zero unprompted mand in generalization. Because Zoe did not adhere to the task analysis steps to provide prompts and deliver reinforcers on time, Taylor had a low level of responding and exhibited challenging behaviors.

Effects of Parent Training on Asian Immigrants

It was constantly noted in previous literature that Asian parents of children with disabilities hold negative perceptions of disabilities (Chan et al., 2002; Chan & Lee, 2004), experience a sense of guilt and shame (Chan, 1997; Chiang & Hadadian, 2007), and often view their children's challenging behavior as a loss of face (Hoffman et al., 2009; Kramer et al., 2002). Therefore, they tend to remain private about their children's diagnoses (Chan & Lee, 2004). However, this was not observed in the three Asian parents of the present study.

Throughout this investigation, all three parents demonstrated positive attitudes toward their children and were open to discussing disability-related issues. This may be due to the fact that the three parents all obtained their higher education degrees and Yan and Zoe have lived in the United States for many years. Parette et al. (2004) reported that Asian Americans who hold higher education degrees and lived in the U.S. for over 10 years tend to have objective perceptions toward disabilities and do not see disability as a source of shame. This finding suggests that parents who are well educated and immigrated to the U.S. for a long period of time may be more acculturated to the Western culture (Kim et al., 2020), and thus less influenced by traditional perceptions on autism from their home countries.

Although the three parents did not demonstrate negative attitudes toward their children with autism, findings of the study showed that the two Chinese parents, Yan and Zoe, were slow and somewhat reluctant to frequently deliver reinforcers. It was observed that they tend to delay and sometimes cancel the delivery of reinforcement for a correct response of their children despite providing reinforcement being a step outlined in the task analysis. This finding is consistent with previous research that Chinese American parents may object to positive reinforcement systems that require them to provide tangible rewards for their children for performing certain behaviors (Lau et al., 2010). One possible explanation is that after hearing a correct mand from their children, the two parents attempted to motivate them to mand again before providing reinforcement, so that they could practice the skill one more time. This finding suggests that when conducting parent training, increasing the content on reinforcer delivery in mand training may be necessary for Chinese-origin parents.

Limitations

Results of the present study should be interpreted with caution because of its several limitations. First, challenging behaviors of the child participants were not measured throughout the investigation. Since challenging behaviors were not within the investigation scope of this study and therefore data on these behaviors were not collected. Although challenging behaviors were never too severe that sessions had to stop, they might have influenced both the parents and their children's performances.

A second limitation was that the progress shown of the child participants might be partly attributed to learning from outside of the parent training of this study. This investigation happened 1-2 times a week for 3-4 months during the school year. It is possible that the three child participants have practiced manding skills in their schools and/or other intervention settings.

A third limitation was the disruption of the investigation from siblings of the child participants. Although a quiet, undisturbed environment was attempted, it was sometimes difficult to achieve in a home environment, especially when the parent was the only caregiver in the house and needed to attend to her other children. Some sessions of Neal and Julia were interrupted by their siblings and that might have influenced their and their parents' performances.

A fourth limitation involved impacts on the findings resulted from different family characteristics and scheduling issues. Mia's baseline performance was higher compared to baseline phases of the other two parent participants. This might be because that she and her husband studied the steps outside of the research sessions and practiced the steps with each other and with Neal. Mia became familiar with the steps shortly after entering baseline. This might have contributed to her high score in the baseline phase. Due to holidays (i.e., Christmas and

New Year) and family commitments and scheduling difficulties, maintenance and generalization phases with Zoe and Taylor were conducted approximately four weeks following their intervention phase-two weeks later than the proposed time frame and the first two dyads. This longer lag might have contributed to their lower level of performance in these two phrases, comparing to the other two families.

Recommendations for Future Research

The increasing Asian immigrant population and the growing needs of quality services for their children with autism urge researchers to develop culturally sensitive programs for this minority group. A valuable component of the present study is that it was focused on Asian immigrant parents with a child with autism. The majority of special education research has been conducted with populations that are predominantly Anglo and failed to identify students with autism according to culture (Dyches et al., 2004). Asian Americans are nearly excluded from the treatment outcome literature (Huey & Polo, 2008). Therefore, it is essential to recruit participants from minority backgrounds and immigrant populations in research to further validate the effectiveness of EBPs with culturally diverse populations and to increase its generalization. Moreover, it helps to provide culturally relevant services and assessments for this population.

Second, future research is recommended to examine the effects of mand training as implemented by fathers. In many Asian cultures, fathers and mothers hold different perceptions of their roles in childrearing and have different expectations of their child (Lau et al., 2010). Specifically, mothers in the Asian culture tend to value family goals over their personal achievement (Wang & Casillas, 2013), and fathers see themselves as a role model for the child (Wang & West, 2016). Mothers often lower their expectations of the child after he/she receives a diagnosis of ASD while fathers hold higher expectations than the mothers (Wang & West, 2016).

Therefore, it would be beneficial to assess the effects of father-delivered training on skill acquisition of children with autism.

Third, when conducting the study, siblings of the child participants demonstrated strong interests in learning the procedures and supporting the child participants. Siblings play a unique role because they are not only family members but also peers of children with disabilities (Sage & Jegatheesan, 2010). In addition, they may be able to assume roles of teachers and caregivers of their brothers and sisters (Stoneman, 2005) and they can have a positive impact on their siblings with autism (Reagon et al., 2006). Therefore, it is meaningful to conduct research in the home settings that involve sibling pairing and training.

Implications for Practice

This study demonstrates positive findings of all three parent-child dyads and provides a guide for practitioners in the field to deliver parent training on a vital social skill. The task analysis is clearly outlined and can serve as a procedural fidelity checklist of parental implementation of mand training. From a practical perspective, protocols on how to handle challenging behaviors may need to occur before parent training can begin. A common error observed across all three parent participants was that they failed to state the name of the item when providing it as the reinforcer for unprompted or prompted mands. Instead, they were more likely to say things such as “yes”, “good job” or say nothing when delivering the reinforcement. It is important to say the name of the item, and only the name of the item when delivering the item. The rationale is that it provides one more chance for the children to hear its name and prevents them from making faulty connections between the name of the item and any other words (e.g., “good job”). Therefore, placing emphasis on this step in mand training in highly recommended.

Additionally, findings of the study may be helpful in developing culturally responsive strategies for practitioners to help Asian minority families with children with autism. Firstly, both Chinese parents in the study demonstrated poor reinforcer delivery. The immediacy of reinforcer delivery following a correct response is critical in promoting the future occurrence of the response. Hence, it may be necessary to include a step in the task analysis that reads "a reinforcer must be delivered within 3 seconds of the occurrence a correct response". This can serve to improve the immediacy of reinforcement provision.

Secondly, immigrant parents might be culturally unfamiliar with the strategies taught in parent training programs, making them difficult to emulate (Lau et al., 2011), therefore, sensitivity accommodating their needs is critical. It is recommended that practitioners schedule a few sessions prior to the start of the training to build rapport with the families. That way, they may feel more supported and understood, which may increase their openness and willingness to fully engage in the following training sessions.

Thirdly, although BST was effective for the parents in the present study, it is recommended that practitioners extend the duration of modeling and rehearsing to achieve meaningful changes. The need for increased dosage of rehearsing and support was suggested in previous research of parent training with Chinese origin families. For example, Crisante and Ng (2003) reported that Chinese origin immigrants needed substantial practice to bolster their behaviors of delivering praises. Likewise, Lau et al. (2011) suggested that additional support to rehearsal is necessary in parent training with Chinese parents. The additional practice will likely increase parents' procedural fidelity and lead to better performance in parent training.

Lastly, parents of children with ASD typically work with a group of professionals. Asian immigrant parents may experience unique challenges when interacting with these professionals

because of their cultural and language barriers (Broder-Fingert et al., 2013; Shorey et al., 2020). Therefore, it is important to encourage them to discuss their struggles in working with professionals. Recurring parent meetings can be set up to address their questions and concerns. In addition, trainings on how to effectively communicate with professionals can also be provided.

Conclusion

This study is the first to investigate parent-implemented mand training involving Asian immigrant families of children with autism. It enriches existing literature by disseminating well-supported practices such as parent training, mand training, and BST to a less-researched minority population. Specifically, the study provides evidence that Asian immigrant parents can learn and implement a mand training intervention to their children with a high level of fidelity, which supports the transportability of evidence-supported parent training with Asian-origin families. In addition, findings of the study demonstrate the effectiveness of using BST to train Asian immigrant parents, which supported its efficacy across cultural and linguistic contexts. Furthermore, this study provides a reliable protocol for practitioners to use when providing parent training on mand training. It also sheds light on developing culturally competent instructions in an essential skill area.

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Appendix A

Mand Probe of Child Performance

Child Participant_____ Date_____

Item	Check	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
	The child emits unprompted mand at step 3A	Y N	Y N	Y N	Y N	Y N
	The child emits unprompted mand at step 3A	Y N	Y N	Y N	Y N	Y N
	The child emits unprompted mand at step 3A	Y N	Y N	Y N	Y N	Y N
	The child emits unprompted mand at step 3A	Y N	Y N	Y N	Y N	Y N
	The child emits unprompted mand at step 3A	Y N	Y N	Y N	Y N	Y N

Appendix B

Preference Assessment: Multiple Stimulus Without Replacement

Child Participant _____ Date_____

1.

Items Presented								
Order								

2.

Items Presented								
Order								

3.

Items Presented								
Order								

4.

Items Presented								
Order								

5.

Items Presented								
Order								

Appendix C

Treatment Integrity Checklist

Baseline	Score		
1. Provide reinforcers, task analysis form, and flow chart to the parents	Y	N	N/A
2. Briefly go over the task analysis and flow chart	Y	N	N/A
3. Instruct the parents to follow the steps and teach their child to request	Y	N	N/A
4. Do not provide verbal interactions with the participants	Y	N	N/A

Parent Training (BST)			
1. Provide PowerPoint presentation and explain each step of the task analysis in detail	Y	N	N/A
2. Provide a handout of the presentation	Y	N	N/A
3. Show video models	Y	N	N/A
4. Model the steps with the parents as the "target child"	Y	N	N/A
5. Rehearse steps	Y	N	N/A
6. Provide immediate verbal feedback on performance	Y	N	N/A
7. Allow enough time to practice as needed and provide feedback	Y	N	N/A

Intervention			
1. Provide reinforcers, task analysis form, and flow chart to the parents	Y	N	N/A
2. Do not provide verbal interactions with the participants	Y	N	N/A

Second Parent Training			
1. Show video models	Y	N	N/A
2. Model the steps directly with the child participants	Y	N	N/A
3. Instruct parents to rehearse with the child participants	Y	N	N/A
4. Provide immediate verbal feedback on performance	Y	N	N/A
5. Allow enough time to practice as needed and provide feedback	Y	N	N/A

Maintenance			
1. Provide reinforcers, task analysis form, and flow chart to the parents	Y	N	N/A
2. Do not provide verbal interactions with the participants	Y	N	N/A

Generalization (Mand for Actions)			
1. Provide reinforcers, task analysis form, and flow chart to the parents	Y	N	N/A
2. Do not provide verbal interactions with the participants	Y	N	N/A

Appendix D

Social Validity Questionnaire

Please circle a number between 1 (strongly disagree) and 5 (strongly agree).

1.	I think manding is an important communication skill for my child to learn.	1	2	3	4	5
2.	I thought the parent training was enjoyable and valuable.	1	2	3	4	5
3.	I will continue to use the mand training procedures with my child.	1	2	3	4	5
4.	I would recommend the mand training procures to other parents seeking to increase manding skills of children child with ASD.	1	2	3	4	5
5.	I am satisfied with my child's outcomes.	1	2	3	4	5