A Culturally Adapted Telehealth Intervention for Parents of Children with Autism in China

by

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Dedication

This dissertation is dedicated my mother, Jianying Wang, and my father, Xianyou Qu, for their endless love, support, and encouragement.

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Abstract

Autism affects about 4.57 million children under the age of five worldwide, and 95% of them live in low-and-middle-income countries, where services are scarce. In China, there is a scarcity of professionals who can provide evidence-based treatments. Families of children with autism often experience delays in diagnosis and treatments, and this waiting period could be used for initial parent education and training.

This dissertation focused on translating an evidence-based practice (EBP), the Parent-mediated Early Start Denver Model (P-ESDM), into a culturally appropriate telehealth intervention for families with a newly diagnosed child in mainland China. The study aimed to: (1) culturally adapt P-ESDM using the Ecological Validity Model (EVM) and family-centered capacity-building approach, (2) determine the feasibility of conducting a randomized controlled trial of this telehealth intervention in the Chinese context, (3) evaluate the intervention implementation by assessing parents' satisfaction, acceptability, appropriateness, and feasibility, and (4) explore the effectiveness of this telehealth intervention on both children's and parents' outcomes.

The first study aimed to report cultural adaptation and feasibility testing. We used EVM to guide the adaptation, and five dimensions were modified: language, person, content, methods, and context. We developed a 12-week telehealth intervention with sixty-three lectures, seventy-five demonstrations, fifty-three commentary videos, eleven practice manuals, and eleven group agendas. A randomized controlled trial (RCT) was conducted with two telehealth conditions: self-directed and web + group therapy. 18 parents in the self-directed condition received

intervention individually through the online learning platform. 19 parents in the web + group therapy condition navigated the same program with weekly 1.5-hour group coaching sessions via videoconferencing. The trial presented promising feasibility results in recruitment capability, retention, parental adherence, and participation. High rates of attendance and completion were observed in the treatment group.

The second study adopted a convergent mixed-methods design to evaluate intervention implementation based on the conceptual framework of implementation outcomes. The quantitative data was collected from the Program Evaluation Survey, which assessed program implementation, parental perceived competence, and self-efficacy. Independent t-tests were conducted to compare survey statistics between groups. The qualitative data was collected from five focus groups and analyzed using thematic analysis. The integration strategies included matching survey questions to focus group prompts and merging the qualitative and quantitative findings through a statistics-by-theme joint display. The mixed-methods findings yield a more nuanced interpretation of the quantitative survey outcomes with qualitative themes that determined implementation outcomes. The mixed-methods results reveal the telehealth intervention was acceptable, appropriate, and feasible for Chinese parents. Group-based coaching via videoconferencing could be a promising home-based service model to increase parental perceived competence.

The third study aimed to explore the effectiveness of this culturally adapted telehealth intervention on both telehealth conditions. Linear Mixed Models were conducted to estimate treatment effects across time and model the longitudinal trajectories of outcomes in both children and parents. The results indicate this culturally adapted telehealth intervention effectively improved children's communication skills and social engagement and alleviated the parenting

stress. Specifically, group-based parent coaching via videoconferencing showed greater improvement in children's quality of life and parent's anxiety outcome.

This dissertation highlights the cultural adaptation and intervention implementation, and it may serve as a reference for clinicians to develop culturally appropriate interventions. The preliminary findings in feasibility, implementation, and effectiveness indicate this culturally adapted telehealth intervention has great potential in Chinese communities.

Chapter 1 Introduction

1.1 Autism Spectrum Disorder

1.1.1 A Historical Review

Autism was first identified by a child psychiatrist, Leo Kanner, in 1943 (Kanner, 1943). Kanner described these children as "inability to link themselves in an ordinary way to people and situations" and stated that they demonstrated atypical development from birth. Autism was originally classified as "childhood schizophrenia" before 1980, it was renamed "infantile autism" and labeled as a separate disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM). Autism was once believed to be caused by cold and unresponsive parenting in the 1960s (Deslauriers, 1967), or by MMR vaccine in the late 1990s (Wakefield et al., 1998). A nationwide cohort research in Denmark discovered that MMR vaccination does not raise the risk of autism, does not trigger autism in vulnerable children, and is not related with autism onset following immunization (Hviid et al., 2019).

Autism spectrum disorder (ASD) is now classified as a neurodevelopmental disorder characterized by impairments in social interactions and communication, and by presence of restricted and repetitive behaviors (American Psychiatric Association & Association., 2013). Today, we know that neither parental styles nor vaccines cause autism. Rather, autism is highly heritable, with certain genes and environmental factors playing a significant role (Lai et al., 2014; Yang et al., 2018).

1.1.2 Risk Factors

Autism is a complex neurodevelopmental condition with a strong genetic basis. Genetic factors play a major role in the etiology of autism (Hallmayer et al., 2011; Yang et al., 2018). Bai et al. (2019) published the results of a large population-based global cohort study including over 2 million people. A total of 22,156 people were diagnosed with autism, for a 1.11 percent overall rate. The study generated a model to examine the liability of autism risk factors. The model comprised four forms of risk, and the results showed that inherited genetic factors explained 81.2% of the variation in autism incidence. This study supports the existing concept of autism as a highly heritable disorder.

Autism affects children of all races and ethnicities, and additional variables might raise a child's risk. These may include: (1) Family history, parents who have a child with autism have about 20% chance of having a second child who is also affected (Hallmayer et al., 2011). (2) Other genetic disorders, about 10% of children with autism are also identified as having Down syndrome, fragile X syndrome, Rett syndrome or other genetic disorders (DiGuiseppi et al., 2010). (3) Parents' ages, children born to older parents are at a higher risk of having autism (*Autism Spectrum Disorder (ASD)*, 2019).

1.1.3 Prevalence

Autism affects 1 in 160 children worldwide, which was estimated by the World Health Organization (WHO, 2013). According to Global Research on Developmental Disabilities Collaborators, about 4.57 million children under the age of five had autism (Olusanya et al., 2018). Estimates of autism prevalence in the United States have been growing in recent years. About 1 in 44 children in the United States was diagnosed with autism based on 2018 data (Maenner et al., 2020). The rise in autism diagnoses is most likely due to improved detection and reporting, an actual increase in the number of cases, or both. In fact, there are many individuals with autism who

stay undiagnosed or not diagnosed until later in life (Stagg & Belcher, 2019). Many young children with autism are referred to inappropriate services due to low autism awareness, insufficient competent personnel, and limited diagnostic capabilities (Malcolm-Smith et al., 2013).

1.1.4 Diagnosis

According to the Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition (DSM-5), autism is characterized by persistent deficits in two aspects: Social Communication and Social Interaction (SCSI) as well as Restricted, Repetitive Behaviors, Interests, and Activities (RRBIA) (American Psychiatric Association & Association., 2013). For a child to be diagnosed with autism, all 3 criteria in the SCSI domain and 2 out of 4 criteria in the RRBIA domain have to be met. The symptoms must have been present in the early developmental period (before 3 years old), they must cause clinically significant impairment in functioning, and they must not be better explained by intellectual disability or global developmental delay.

The transition from the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition–Text Revision (DSM-IV-TR) to DSM-5 merges Autistic disorder, Asperger's disorder, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) into one diagnostic category - autism spectrum disorder. The merge was grounded on the empirical finding that the classification of subtypes varied substantially across clinical sites, thus leaving the categorical division less meaningful (Kim & Lord, 2012; Lord, Petkova, et al., 2012). The transition from DSM-IV to DSM-5 may be viewed as representing a move from a more categorical conception of autism to a more dimensional view (Lord & Jones, 2012).

The Autism Diagnostic Observation Schedule - second edition (ADOS-2) (Lord, Rutter, et al., 2012) and the Autism Diagnostic Interview-revised (ADI-R) (Lord et al., 1994) are two "golden standards" diagnostic instruments. The ADI-R is a standardized, semi-structured clinical interview

for caregivers that focuses on three primary areas of behavior: aspects of reciprocal social interaction, communication, and language, and confined and repetitive, stereotyped interests and activities. The ADI-R is appropriate for children and adults with mental ages ranging from 18 months to adulthood. Meanwhile, the ADOS is a semi-structured, standardized observation of children's communication, social interaction, play, and restricted and repetitive behaviors. The examination includes a variety of activities that evoke behaviors that are directly related to an autism diagnosis. Clinicians can gain information that guides diagnosis, treatment planning, and educational placement by observing and coding these behaviors.

The Lancet launched a Commission on the Future of Care and Clinical Research in Autism (Lord et al., 2022). The Commission suggested a stepped and personalized approach to assessing the developmental and functional characteristics of all neurodevelopmental disorders, with an emphasis on individual and family needs. This was in line with the dissertation's objectives of developing a culturally appropriate telehealth intervention for families of children with autism in China and testing its implementation, feasibility, and effectiveness in a randomized controlled trial.

1.1.5 The Onset of Autism and Behavioral Symptoms

A number of reviews have summarized current knowledge of early biomarkers in autism. There are a number of behavioral markers that distinguish high-risk infants who later meet criteria for autism, including decreased response to name, lack of eye contact, delays or atypicality in the use of gestures, deficits and delays in joint attention, delay in verbal and non-verbal communication, and elevated frequency of repetitive behaviors (Ozonoff et al., 2008).

Three different onset patterns are reported in autism (Ozonoff et al., 2008; Rogers & DiLalla, 1990) as Figure 1.1. In the first pattern, symptoms appear to be present from birth (ASD-Early onset). The second pattern involves early milestone achievement followed by a

developmental plateau (ASD-Late onset). The third pattern shows a clear developmental loss of previously acquired skills (ASD-Regression).

It seems that atypical behaviors in the first year are subtle and lie outside of the core symptoms of autism, such as in sensorimotor development and in emotion regulation like reduced positive affect and increased perceptual sensitivity (Clifford et al., 2013). There is a growing interest in whether atypical motor patterns may appear early and possibly predate social and communication markers. General delays in gross and/or fine motor skills have been reported in high-risk infants (Baird et al., 2006) and research has suggested very early emerging abnormalities are in motor control. For example, in a preliminary study of 40 high-risk infant siblings, researchers (Flanagan et al., 2012) reported that head lag at 6 months was predictive of a subsequent diagnosis of autism at 30 to 36 months. Scientists also found that motor delays at 6 months were predictive of social communication delays across the high-risk cohort (Bhat et al., 2012). Moreover, Bolton et al. (2012) reported that fine motor behaviors were among a larger set of parent-report items on a general developmental screening tool that was informative for risk of autism at 6 months of age.

Although these studies suggest that, in some cases, delayed or atypical motor patterns may be predictive of autism, it is hard to distinguish autism from other developmental delays using only these signs in the first year. And current diagnosis tools mainly code impaired skills that required integration of multidimensional domains, such as skills in reciprocal social interaction which requires coordination among social, motor, and emotional skills. In other words, while there are signs of atypical development within the first year in infants at-risk, it isn't until the second year of life that core symptoms emerge that show phenotypic continuity and specificity for an autism diagnosis. Again, it is also possible that the lack of behavioral signs in the first year reflects the limitations of the measures and retrospective designs.

It is important to identify the early motor development in autism at risk and examine the association between infant motor development and later social deficits in autism at-risk population. The understanding of the relationship between the sensorimotor deficits in the first year and later social core symptoms may reveal the developmental origin of autism and help understand the underlying mechanism of early emerging symptoms of autism. Meanwhile, the identification of specific motor abnormalities in early infancy may result in earlier detection of autism and early intervention.

1.1.6 Treatments for Autism

Current autism treatment and intervention services include a wide range of approaches, such as behavioral, developmental, educational, psychological, and complementary and alternative approaches (CDC, 2019). 27 effective evidence-based practices (EBPs) for children with autism were identified by the National Professional Development Center on Autism Spectrum Disorder (NPDC) (Wong et al., 2015). It included naturalistic intervention, discrete trial training, exercise, parent-implemented interventions, peer-mediated instruction and intervention, pivotal response training, and other techniques used in behavioral therapy, such as prompting, extinction, and time delay.

1.1.6.1 ***Early Start Denver Model***

The Early Start Denver Model (ESDM) is an evidence-based intervention specifically developed for very young children with autism (Rogers & Dawson, 2010). ESDM is a play-based intervention for children with autism between the ages of 12-48 months based on behavioral and developmental principles. Parents and therapists use play and joint activities to build a positive and fun environment for the child to boost language, social and cognitive skills (Rogers & Dawson, 2009).

ESDM has been found to be effective for children with a wide range of learning styles and abilities. It can help children make progress in their social skills, language skills, and cognitive skills. ESDM can be implemented in different natural settings such as the home, daycare, or preschool by trained therapists as well as by parents through play and daily routines (S. Rogers et al., 2012). ESDM aims to use positive affect to increase a child's motivation and interest in an activity or person, thereby reducing the symptoms of autism and targeting all developmental areas. Many studies showed the effectiveness of the ESDM among children with autism. Dawson et al. (2010) first used an RCT to assess the efficacy of the Early Start Denver Model for improving outcomes of toddlers with autism. The intervention resulted in significant improvements in IQ, language, adaptive behavior, and autism severity among toddlers less than 2.5 years old.

Parent involvement is a key part of the ESDM program. Sally Rogers et al. (2012) conducted a randomized controlled trial involving 98 children and families to examine the efficacy of a 12-week, low intensity, parent-delivered intervention for toddlers at risk for autism. This Parent-delivered Early Start Denver Model (P- ESDM) consists of 12 consecutive sessions that each last 1-h in length. The intervention sessions were conducted in a clinic setting. In session one, the children's learning objectives were developed. Session 2–10 parents were introduced the new topic each week through verbal description and written materials from the manual and briefly modeled the interaction skills with the child in play. Parents were coached in each of ten intervention techniques: increasing child's attention and motivation; using sensory social routines; promoting dyadic engagement and joint activity routines; enhancing nonverbal communication; building imitation skills; facilitating joint attention; promoting speech development; using antecedent–behavior–consequence relationships ("ABCs of learning"); using prompting, shaping, and fading techniques; and conducting functional assessment of behavior to develop new interventions. Sessions 11 and 12 focused on maintenance after treatment and review of progress.

Both groups of parents improved interaction skills, and both groups of children demonstrated progress.

1.1.6.2 *Family-Centered Care in Early Intervention*

Early intervention is defined as intervention services provided to children with developmental delays and disabilities from birth through 3 years old. In the United States, early intervention services for children birth to 3 years old fall under Part C of the Individuals with Disabilities Education Improvement Act ("Individuals with Disabilities Education Improvement Act Regulations," 2004). Part C of IDEIA mandates that early intervention services be delivered in the child's natural environment (i.e., home, community, or daycare) and services be family-centered (i.e., focusing on family needs and priorities). The Division of Early Childhood of the Council for Exceptional Children Recommended Practices for early intervention additionally include family-centered care, family capacity building (providing families with knowledge and skills), and family and professional collaboration (families as partners in early intervention services) within consideration of best practices (*DEC Recommended Practices*, 2014). As a result, early intervention services should be intended to focus on family needs and priorities. Research suggest that early intervention delivered in a family-centered manner holds many benefits for children and families including improved developmental outcomes and potential reduction in the need for special education within the public-school setting, in turn, proving to be cost-effective (*DEC Recommended Practices*, 2014; Dunst et al., 2007; Petr & Allen, 1997; Trivette & Keilty, 2017).

Family-centered care (FCC) is defined as practices respecting and honoring families' critical roles in their child's development by providing families with the necessary information to

make informed decisions about their child's services (Dunst et al., 2007). It is a partnership approach to health care decision-making between the family and health care provider.

FCC is considered the standard of pediatric health care by many clinical practices, hospitals, and healthcare groups (Trivette & Keilty, 2017). Family-centered early intervention is based on practice principles that are designed to enhance self-determination of parents of youths with a disability, parent–provider collaborative decision-making processes, and parent self-efficacy. Petr and Allen (1997) reiterated the dimensions of family-centered practice as (1) Centrality of the family (the staff member cares about the entire family, not just the child with special needs); (2) Informed decision making by families (the staff member makes it clear that the family, not the professional, is responsible for deciding what is done for the child and family); (3) A strengths perspective (the staff member understands that parents know their child better than anyone else does). In family-centered practice, providers assume the role of facilitator and collaborator, not of expert whose knowledge exceeds that of the parents.

Interventions addressing any part of the family unit (e.g., parent or child skill acquisition) may result in more positive child outcomes and/or improved parent and family outcomes. Family-centered Early Intervention that includes parent education has been linked to improved child outcomes, more positive parent perceptions of child behavior, and greater perceptions of parental self- efficacy (Dunst et al., 2007). The ultimate goal of such services should be to work together continuously with families to obtain optimal outcomes for children and families in early intervention.

1.2 Motor Development in Autism Spectrum Disorder

1.2.1 Theoretical Foundation

1.2.1.1 *Dynamic Systems Theory*

Theories of motor development, like other developmental domains, experienced a nature-nurture dichotomy debate and a domination time in maturation-based theories. Early pioneers in the 1930s and 1940s provided the first detailed descriptions of change in infants' motor skills. For example, Gesell and Ames (1940) identified 22 stages in the development of crawling, beginning when infants lifted their heads from a prone position and ending when they could crawl smoothly on their hands and feet. McGraw (1943) described seven primary stages in the development of walking, progressing from newborns' reflexive stepping movements to independent walking at the end of infants' first year. These researchers believed that motor development resulted from neuromuscular maturation – largely autonomous changes in infants' brains, muscles, and growing bodies. Based on that, normative descriptions of motor milestones according to maturation process were widely published in books, journals, and newspaper columns and are still the accepted guidelines for informing clinicians, doctors, and parents about the path of normal motor development.

The contemporary theory of motor development is the dynamic systems theory (DST) popularized and expanded by developmental psychologist Esther Thelen (Thelen & Smith, 1996). From a DST perspective, a new motor skill is self-organized and may emerge from the confluence of many interacting factors. For example, independent walking may emerge when infants have sufficient muscle strength, slimmed-down body proportions, motivation to go someplace, balance control, the appropriate environmental properties to support the action, as well as brain maturation (Thelen et al., 1991).

In general, DST suggests that development is a process of self-organization, among multiple systems, within the organism and without, driven by interactions and experiences. In addition, DST posits that behavior changes in response to repeated cycles of perceiving and acting and to variations in the contextual demands or intrinsic capacities of the system, as a result, the behavior is

adaptive and flexible (Ulrich, 2010). For example, infants take their altered bodies into account while planning future actions. With small weights attached to their wrists, sitting infants reduce the frequency of reaching to far-off targets but not to nearby ones, indicating that they perceive the increased risk of losing balance while leaning forward with a heavy hand (Rochat et al., 1999). With lead-weighted shoulder packs, infants' ability to walk down slopes is reduced compared to their abilities while wearing featherweight packs (Adolph & Avolio, 2000).

1.2.1.2 *Perceptual-motor Learning*

A second prominent influence in motor development is the perception-action approach inspired by James and Eleanor Gibson (Gibson, 1992). They argue that perception and movement are linked together. To be planned and executed adaptively, actions require perceptual information about the relevant properties of the environment and the body, and the relationship between them. For example, exploratory movements of the eyes, head, body, and extremities generate perceptual information in light, sound, muscles, and skin. Actions generate more information for perceptual systems. Perceptual-motor learning is critical for exploratory movements and for discriminating and using the relevant information obtained from exploration.

Eleanor Gibson believed that perceptual learning is the process whereby perceptual information becomes increasingly differentiated and specific to the things in the world and to what one can do with those things (Adolph & Kretch, 2015). Gibson's focus on differentiation and increasing specificity sets her theory apart from traditional theories of perceptual learning. On the traditional account, perception requires more than the available sensory stimulation; in other words, perceptual learning is a process of learning to enrich impoverished input. Gibson and Gibson (1955) pointed out that the traditional enrichment view requires perceptual learning to produce percepts that decrease in correspondence with the available information. The Gibsons proposed to

the contrary that perceptual learning should result in percepts that increase in correspondence with the available information. Rather than an add-on process, perceptual learning is a process of differentiation, selection, and extraction of information; the information was always present, just not previously detected.

Dynamic Systems Theory researchers examine how multiple routes can converge on the same developmental pathway, and how similar routes can lead to different outcomes. Perception-action researchers study how individuals update their assessment of their own abilities from moment to moment and from one developmental milestone to the next. Both dynamic systems theory and perceptual-motor approach believe that there are multiple pathways to achieve the same functional goal. For example, the direction of self-locomotion is specified redundantly by patterns of visual flow, vestibular information, proprioceptive information from muscles and joints, and occasionally auditory input.

1.2.2 The Motor Development Trajectory in Children with Autism

Typically developing (TD) infants progress through a series of gross and fine motor milestones, such as rolling, sitting, and grasping (Adolph & Robinson, 2015; Gesell & Ames, 1940). However, motor behaviors and milestones in the infants who were later diagnosed with autism during the first year are different compared to TD children.

Atypical body movements, asymmetries in posture, abnormal muscle tone, fewer midline movement, and delay in motor milestones were observed in infants who were later diagnosed with autism in prospective and retrospective design studies (Gima et al., 2018; Heathcock et al., 2015; Ozonoff et al., 2008). Flanagan et al. (2012) evaluated postural control in 6-month-old infants at high-risk using a pull-to-sit task. They found that infants later diagnosed with autism presented a significantly higher frequency in head lag (present in 9/10 infants). Iverson and Wozniak (2007)

discovered that the walking onset was delayed in infants who were later diagnosed with autism. Infants who were later diagnosed with autism demonstrated atypical exploration of objects (Koterba et al., 2014).

Fournier et al. (2010) suggested that children with autism experienced atypical development in gross and fine motor and presented atypical movement patterns during locomotion and goal-directed actions. Ozonoff et al. (2010) examined trajectories of scores on the Fine Motor Subscale of the Mullen Scales of Early Learning and observed that the fine motor delay became significant between 12 and 18 months. Lloyd et al. (2013) discovered gross and fine motor skills were delayed in children with autism at 12 months and these children fell further behind as they get older at 36 months. Landa and Garrett-Mayer (2006) observed significant delays in both fine and gross motor skills at 14 months in infants who were diagnosed with autism at 24 months. Children with autism aged 3-4 years were found to achieve very poor motor skills compared to the normative data (Jasmin et al., 2009). Gross and fine motor skills are observed to be significantly lower in children with autism aged 3–16 years (Liu & Breslin, 2013). Results from studies above highlight the need for clinicians and therapists to include motor evaluations and interventions in the standard-of-care for children with autism.

Motor impairments are amongst the earliest and most consistent signs of autism spectrum disorders but are not used as diagnostic criteria. The identification of specific motor features in early infancy that characterize children who develop or are at risk of developing autism may guide efforts for earlier diagnosis and screening. Several studies provided evidence of early motor impairments in infants who later develop autism, such as poor postural control (Gima et al., 2018), head lag (Flanagan et al., 2012), difficulties with fine motor skills, such as grasping, reaching, and pointing (Libertus et al., 2014) and gait abnormalities (Kindregan et al., 2015). Early motor impairments have a cascading effect on other developmental domains, such as cognitive,

communication and social development (Bruyneel et al., 2019; Hannant et al., 2016). A growing body of evidence suggests that visual-motor skills, manual motor skills development, and basic perception-motor impairments influence both social and language development in individuals with autism. Miller et al. (2019) concluded through kinematic analysis, that individuals with autism displayed slower but more fluid patterns of movement compared to children with Developmental Coordination Disorder who were less fluid. They suggested that the difference possibly influenced by latencies in sensory structures. However, both groups display impairments in posture control compared to typically developing individuals. However, the early motor development in children at high risk of autism is usually neglected, and motor skills training is not considered as a priority for autism among early intervention studies. It is important to highlight motor impairments as an early sign in autism, it is now crucial to consider the relationships between poor motor skill and the social cognition difficulties in early onset of autism.

1.2.3 Motor Development and Social Communication in Children with Autism

It was estimated that about 35% of individuals with autism presented with some forms of motor impairments (Licari et al., 2020). Motor delays can negatively influence the development and severity of social and communicative symptoms. The development of motor function is linked to a child's capacity for language, cognitive, and social development (Moseley & Pulvermüller, 2018). It is well accepted that early emergence of motor impairments has a downstream impact on key aspects of social and communicative development, for example, impairing a child's ability to gesture and interact with other children in play (Bhat et al., 2012). Studies have indeed shown that motor impairment in autism is predictive of language development (Moseley & Pulvermüller, 2018).

Motor development (independent sitting and prone development) was related to the emergence of both verbal (babble onset) and nonverbal (gesture onset) communicative milestones from 5-10 month (LeBarton & Iverson, 2016). And crawling and walking in infants leads to changes in social interaction from parents (Campos et al., 2000; Franchak et al., 2011) and improvements in language skills (West et al., 2019). Fine motor skills at 27 months predict expressive and receptive language at 45 months (Hellendoorn et al., 2015); furthermore, a large-scale study with over 1000 individuals with autism ranging from 2 to 15 months found that this strong predictive relationship between fine motor skills and expressive and receptive language scores (Mody et al., 2017).

Moreover, gross motor scores (Bedford et al., 2016) and the onset of walking (West & Iverson, 2017) were reported as a significant predictor of both expressive and receptive language development in young children with autism. As walking onset supports early language learning in typical development children, research found that both high-risk with no diagnosis and high-risk with language delays groups demonstrated significant linear growth in expressive and receptive language development following milestone attainment; however, only infants with an eventual autism diagnosis did not show increased language growth following walking onset (West et al., 2019).

In autism, the relationship between motor skills in toddlerhood and receptive and expressive language in childhood is mediated by reduced exploration of objects and environment. Gross motor scores (Bedford et al., 2016) and onset of walking (West & Iverson, 2017) were reported as a significant predictor of both expressive and receptive language development in young children with autism. As walking onset supports early language learning in typical development children, research found that both high-risk with no diagnosis and high-risk with language delays groups demonstrated significant linear growth in expressive and receptive language development following

milestone attainment; however, only infants with an eventual autism diagnosis did not show increased language growth following walking onset (West & Iverson, 2017).

To sum up, the development of social and communicative competence depends on the integration of skilled behaviors, especially using motor skills in a functional context. In a neurodevelopmental disorder such as autism, it is not surprising that gross and fine motor delays may be among the earliest identifiable signs distinguishing infants with autism from their typically developing peers. However, based on the relationship between early motor experiences and the emergence of social behaviors in autism, motor intervention, or movement-based intervention should be advocated because it may provide an entrance or support the transition in developing social and communicative abilities. Meanwhile, the findings from Sutera et al. (2007) indicated that the motor skills at 2 years old was the clearest predictor of optimal outcomes in toddlers diagnosed with autism at 4. As a result, the investigation of the neural mechanism of the motor development in children at risk of autism is important to further our understanding of autism. Moreover, the design of an effective interventions with motor strategies and the evaluation of its effectiveness can provide another intervention strategy for specialist and affected families.

1.3 Parent Training for Parents of Preschoolers with Autism

1.3.1 Parent Training

In the field of autism, the term "parent training" is used to describe a broad range of interventions which may involve the parent as primary clients or as person who delivers in an intensive child-focused therapy program. This mainly result from the complexity of autism and the multiple targets of intervention. K. Bearss et al. (2015) proposed a taxonomy with two broad categories: Parent Support and Parent-Mediated Intervention (PMI) to delineate parent training programs in autism population. These broad categories can be further divided into care

coordination, psychoeducation (under parent support programs), and parent-meditated interventions for core symptoms or for maladaptive behaviors (Figure 1.2). Summary of Characteristics of the Parent training in autism is shown in Table 1.1.

1.3.1.1 *Parent Support*

Parent support encompasses programs intended to provide indirect benefit to the child by providing support to the parent and increasing parental knowledge about autism. Parent support can be categorized as care coordination and psychoeducation. Psychoeducation occurs informally during regular clinical practice, while structured psychoeducational programs are generally short term in duration (i.e., 6–12 sessions) and can be conducted in group or individual settings, mainly targeting on behavioral management strategies or intervention techniques.

Psychoeducational programs can help parents of children with autism reduce levels of worry, depression, anxiety and stress; and change parenting behaviors as well. DaWalt et al. (2018) reported outcomes of an 8-week program designed to reduce family distress and improve social functioning for adolescents with autism. Results indicated significant improvements in parental depressive symptoms and problem solving; social interactions also improved for youth in the intervention group relative to controls. Similar findings were also reported from a randomized controlled trial for 62 mothers of children with autism using WhatsApp to deliver a 6-session psychoeducation intervention. Changes in stress and depression were statistically significant after the intervention and an 8-week follow-up (Hemdi & Daley, 2017). Meanwhile, mothers' communication behavior changed significantly in terms of information giving, praise, corrective responses, and direct response after 6-month intervention (Blacher et al., 2013).

Psychoeducational programs also provide parents of children with autism with certain coping strategies to deal with overall physical and emotional demands of caring for their child,

leading to more effective coping and reducing caregiver distress. Research showed that caregivers of children with autism who underwent a coping effectiveness training felt more confident in their ability to cope with daily routines with their child with autism (Smith et al., 2018). Couples' satisfaction between parents of children with autism was associated with low parenting stress, increased use of positive and decreased use of negative dyadic coping strategies (Sim et al., 2017). Research showed that a parent education program with specific strategies to manage disruptive behavior of children with autism effectively helped parents manage the challenging behaviors of their children compared to a psychoeducational program without (Karen Bearss et al., 2015; Iadarola et al., 2018), and improved parental competence while reducing parental stress and parental strain (Iadarola et al., 2018).

1.3.1.2 *Parent-Mediated Interventions*

Parent-mediated Intervention (PMI) is an effective evidence-based practice (EBP) which was identified by the National Professional Development Center on Autism Spectrum Disorder (NPDC) (Wong et al., 2015). PMI focuses on teaching parents how to promote social interaction, communication, imitation, and play skills for their children with autism (K. Bearss et al., 2015; Oono et al., 2013). PMIs are mainly technique-focused where parents participate in the therapy and the child is the direct beneficiary of treatment. Systematic reviews suggested the benefit of parent-mediated interventions in children with autism included motivation to interact, joint attention, imitation, nonverbal and verbal communication (Estes et al., 2014; Jurek et al., 2021; Nevill et al., 2018; Oono et al., 2013). PMIs have been widely adopted for very young children with autism, such as JASPER (Kasari et al., 2006; Kasari et al., 2010), Project ImPACT (Ingersoll & Wainer, 2013; Stadnick et al., 2015), Parent-mediated Early Start Denver Model (P-ESDM) (S. Rogers et al., 2012; Vismara et al., 2013). PMIs have shown promising effectiveness (Deb et al., 2020) in

home settings (Poslawsky et al., 2015; Siller et al., 2013), clinical settings (Green et al., 2010), community settings (Eapen et al., 2013; Edwards et al., 2019; Stadnick et al., 2015), and school settings (Goods et al., 2013).

One of the representative studies was a multisite randomized trial in children with autism in the UK in 2010, in which the investigators compared a parent-training technique that targeted to enhance child's social-communication skills with treatment as usual (Green et al., 2010). Results showed no group difference in children's language. However, parent ratings of language and social communication showed a strong effect after a 13-month Preschool Autism Communication Trial (PACT). The intervention significantly changed parent-child dyadic social communication in ways that were associated with subsequent positive child outcomes in longitudinal studies of autism (Green et al., 2010). Another study by the same investigators in 2015 compared infant attentiveness and autism-risk behaviors between PMIs and no intervention for infants as high risk of autism. Results showed significant improvements in infant engagement and autism symptoms as well as changes in parents' behavior after 6 core sessions in 5 months (Green et al., 2015). This study showed that teaching parents to respond to cues from babies at high risk of autism eased the severity of autism features at age 3. The finding suggested interventions aimed at educating parents can spark lasting gains in children (Green et al., 2017).

The effectiveness between parent-mediated interventions (PMIs) and parent psychoeducational interventions (PEI) is compared in research. Results revealed significant effects of the PMIs leaded in improvement of joint engagement and play skills, higher levels of responsive behavior in children, and optimal parent-child interaction; while the PEI intervention was found to be effective in reducing parenting stress associated with child characteristics and changing the behavior pattern of parents (Kasari et al., 2015; Shire et al., 2016; Tonge et al., 2014). These data highlight the benefit of a brief, targeted, parent training intervention on both child and parent

outcomes, and findings encourage a focus on the combination of PMIs and PEI treatments in future study.

1.3.2 Parental Dynamics in Parents of Children with Autism

Parental dynamics in parents of children with autism were studied, including parenting behavior (Blacher et al., 2013), parenting stress (Lindsay et al., 2016), and parenting styles and dimensions (Phillips et al., 2017; van Steijn et al., 2013).

Blacher et al. (2013) observed positive and negative parenting behaviors in mothers of children with DS, autism, cerebral palsy, developmental delay, and typical development (TD) children. The observations were conducted of parenting behavior across ages 3, 4, and 5 during structured and unstructured activities. Results indicated that mothers of TD children showed the lowest ratings of negative parenting. Negative parenting behaviors were higher in structured activities and higher in mothers of children with disabilities. Another study found that parents tended to apply a more permissive parenting style towards children with autism (van Steijn et al., 2013). This suggests that, only the permissive (and not the authoritative and authoritarian) parenting style is evoked by child pathology.

Research suggests that parents of children with autism experienced significant higher levels of stress compared to parents of typically developing children (Barroso et al., 2018), and also higher than parents of children with other disabilities (Estes et al., 2009; Phetrasuwan & Shandor Miles, 2009). Parents of children with autism started to report high levels of stress after the diagnosis of their children (Gupta, 2007; Meirsschaut et al., 2010). From then, the severity of the child's autism symptoms (Ingersoll & Hambrick, 2011; Kasari et al., 1997; Lyons et al., 2010) and the co-occurring behavior problems (Lecavalier et al., 2006; McStay, Trembath, et al., 2014) were two main causes reported to be associated with levels of parenting stress. Highly stressed parents

are more likely to experience other mental health problems because of the impact chronic stressors can have on their cardiovascular, immune, and gastrointestinal systems (Miodrag & Hodapp, 2010). Elevated levels of depression and anxiety were also reported by parents of children with autism (Padden & James, 2017), leading to a lower quality of life (Vasilopoulou & Nisbet, 2016) and decreased parenting self-efficacy (Giallo et al., 2013).

To sum up, parents play a key role in the development of children with autism. The goals of the parent education and training for parents of children with autism should target at the wellbeing of the entire family, both child and parents. Due to the heterogeneity of autism, families of children with autism experience differently. Parent training and parent-mediated interventions should consider the family as a whole from diverse dimensions to meet the family goals and needs. Research should focus on the development of culturally appropriate, accessible and affordable, evidence-based interventions for children with autism and their families.

Table 1.1 Characteristics of the Parent Training in Autism Spectrum Disorder

		Parent Support		Parent-Mediated Intervention	
		Care Coordination	Psychoeducation	For Core Symptoms	For Maladaptive Behavior
1	Format	Social worker; Case manager; Pediatrician	Self-guided; Therapist-guided; clinical practice	Therapist-guided programs; Therapist-coaching parents-mediated	Therapist-guided programs; Therapist-coaching parents-mediated
2	Intensity	Low intensity Programs may include brief consultation with a care coordinator or bi-monthly meetings with a therapist.	Medium intensity Programs may include 6–12 sessions (60–90 min/); Weekly outpatient or in-home sessions.	High intensity Programs may involve multiple sessions a week or day (30–90 min/session).	High intensity Programs may involve multiple sessions a week or day
3	Location	Clinic / Care center	School; care center; Online presentation or delivery via telehealth	Home-based; Community-based; Clinic-based; School-based.	Home-based; Community-based; Clinic-based;
4	Duration	1-6 months	1 week to 2 years	5-36 months	6-12 months
5	Target age	Infants; Preschoolers; Children; Adolescents	Infants; Preschoolers; Children; Adolescents; Adults	Infants; Preschoolers; Children	Preschoolers; Children; Adolescents
6	Theory-based strategy	Brief consultation	Lectures on ASD; behavior management; coping strategies	Early intervention; Applied behavior analysis; Multi-discipline therapy (PT;OT; ST; SE)	Applied behavior analysis; TEACCH®; Discrete Trial Training

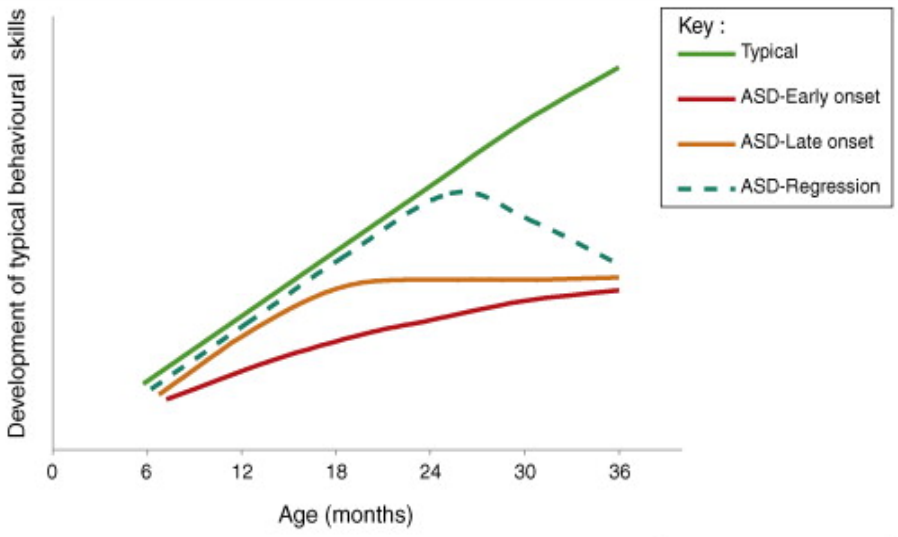

Figure 1.1 Three Different Onset Patterns of Autism Spectrum Disorder

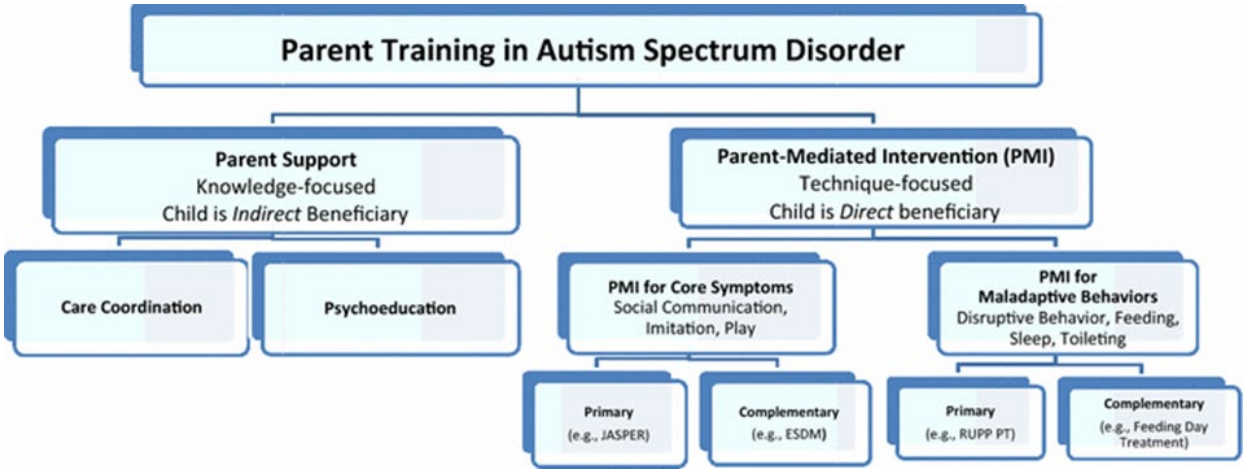

Figure 1.2 Categories of Parent Training in Autism Spectrum Disorder

Chapter 2 Designing a Culturally Adapted Group-Based Parent Coaching Intervention: A Randomized Feasibility Trial

2.1 Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that was identified as a global public health concern by World Health Organization (WHO, 2013). According to Global Research on Developmental Disabilities Collaborators, about 52.9 million children under the age of five had developmental disabilities (i.e., epilepsy, intellectual disability, hearing loss, vision loss, autism spectrum disorder (4.57 million), and attention deficit hyperactivity disorder), and about 95% of these children lived in low-income and middle-income countries (LMIC) (Olusanya et al., 2018). Unfortunately, the majority of children with autism in LMIC are underrepresented in autism research (Durkin et al., 2015; Kieling et al., 2011). The socioeconomic disparities in autism research may lead to an incomplete understanding of autism by neglecting the important cultural, social, and biological variability among these populations (Collins et al., 2011; Durkin et al., 2015). Moreover, research to date has not yet determined the applicability and translational potential of existing diagnostic tools and treatments across cultures and socioeconomic statuses (Durkin et al., 2015; Lord et al., 2022). The lack of representation of these culturally, linguistically, and socioeconomically diverse communities in autism literature requires more research into effective treatments for children with autism and their families in LMIC, allowing the majority of the autism population to benefit from autism studies.

Research is critical in low-resource settings for developing and implementing treatments that are culturally appropriate, acceptable/affordable to parents, and feasible to implement.

Current autism treatment and intervention services include a wide range of approaches, such as behavioral, developmental, educational, psychological, and complementary and alternative approaches (CDC, 2019). Parent-mediated intervention (PMI) is one of 27 effective evidence-based practices (EBPs) identified by the National Professional Development Center on Autism Spectrum Disorder (NPDC) (Wong et al., 2015). PMI focuses on educating parents about intervention strategies that can support children's development in social interaction, communication, motor imitation, and play skills in natural environments (K. Bearss et al., 2015; Oono et al., 2013). PMIs have been highly adopted for very young children with autism both in clinical and community settings (Nevill et al., 2018). Extensive research has shown that well-designed PMIs that coach parents on how to interact with their young children with autism can effectively promote children's social behavior and communication. Such interventions were tested in low-intensity by well-designed randomized controlled trials (RCTs), including Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER) (Kasari et al., 2006; Kasari et al., 2010), PACT (Green et al., 2010), Project ImPACT (Ingersoll & Wainer, 2013; Stadnick et al., 2015), and Parent-mediated Early Start Denver Model (P-ESDM) (S. Rogers et al., 2012; Vismara et al., 2013). However, most PMIs have been developed in English and evaluated predominantly in resource-rich areas (Green et al., 2010; Green et al., 2015; Green et al., 2017; Kasari et al., 2015; Liu et al., 2020; Nevill et al., 2018; Oono et al., 2013). Much is unknown about how children with autism and their families from varied cultural or linguistic backgrounds respond to existing treatments, as well as whether they are culturally appropriate and feasible for families in different contexts.

Existing research recognizes the critical role that cultural adaptation plays in healthcare services or intervention studies (Baumann et al., 2015). Cultural adaptation is defined as "the

systematic modification of an evidence-based treatment (EBT) or intervention protocol to consider language, culture, and context in such a way that is compatible with the client's cultural patterns, meaning, and values" (Bernal et al., 2009). The adaptation of existing treatments could better serve the needs of children with autism and their families in the low-resource area. For example, parents in South Africa preferred an inexpensive, personalized, and home-based early intervention that allowed them to be actively involved in determining treatment goals for their child with autism(Guler et al., 2018). In addition, culturally adapted intervention studies have shown a high percentage of participation and retention rate (Divan et al., 2015). A parent training study in Ethiopia adapted the World Health Organization's Caregiver Skills Training program, and it reported 100% participation and 90% of retention rate (Tekola et al., 2020). Guler et al. (2018) proposed PMI should incorporate caregiver preferences into the design and develop an affordable and scalable solution. Specifically, PMI in low-resource countries should be applicable to a variety of modes in service delivery as well as addressing parental stress from a cultural perspective (Harshini & Preeti, 2017).

A culturally appropriate parent intervention for children with autism and their families is desperately needed in China. Firstly, China holds the second-largest child population in the world (World Bank). According to China's Seventh National Population Census (Ning, 2021), there were 253.38 million children under 14 years of age. Even though the prevalence of Autism in China was reported relatively low about 0.70-1.00% (Sun, Allison, Matthews, et al., 2013; Sun et al., 2019; Zhou et al., 2020), with current estimates there are at least 1.8-2.5 million children in China have autism. Secondly, the adoption of EBPs for children with autism and their families in China was severely limited due to a lack of resources and trained professionals. In 2015, China's pediatricians were just 100,000, and rehabilitation-related therapists, including

physical and occupational therapists, were less than 30,000 (Wu et al., 2015). Shi et al. (2019) reported there were 30122 psychiatrists in China by the end of 2015, with child psychiatrists less than 500 (Wu & Pan, 2019). Until January 2022, there were 100 registered BCBAs and 7 BCBA-Ds in China according to the Behavior Analyst Certification Board Registry(Board, 2022). The scarcity of specialists affects timely diagnosis and leads to delayed treatments and limited evidence-based services in China (Su et al., 2013; Xiong et al., 2011). McCabe (2012) discovered that interventions for autism in China often used a mix of methods, and evidence-based practices coexisted with self-designed interventions (Clark et al., 2019). Liu et al. (2020) conducted a systematic review examining evidence of parent-mediated interventions in China. Only four identified programs (4/21) met the criteria in using evidence-based intervention models, and 3 of 21 identified studies reported the use of cultural adaptation, and over half (14/21) of the included studies failed the quality evaluation. Research of EBPs using RCTs with a rigorous methodology, such as adequate sample size, blind outcome assessments, and the use of standardized measurement, are becoming increasingly important to improve the quality of evidence in China (Liu et al., 2020; Weitlauf et al., 2014).

Culturally adapting an EBP for children with autism and their families in China requires scientific theories to guide intervention development and implementation. Conceptual frameworks have been established to support cultural adaptation studies (Mejia et al., 2017). Bernal et al. (1995)'s Ecological Validity Model (EVM) identifies eight dimensions to modify in the intervention content and delivery: language, persons, metaphors, content, concepts, goals, methods, and context. Resnicow et al. (2000) proposed a cultural sensitivity model which differentiates between surface- and deep- structure adaptations. In addition to these two models which focus on "what" to adapt, Barrera Jr and Castro (2006) emphasizes the process of

adaptation with four steps described as (1) information gathering, (2) preliminary adaptation design, (3) preliminary adaptation tests, and (4) adaptation refinement. Mejia et al. (2017) discussed the need to consistently report cultural adaptation procedures by comparing three different parenting intervention projects. Mejia et al. (2017) highlighted a shift in cultural adaptation thinking from "a dichotomous 'either-or' perspective to an inclusive 'both-and' approach". This indicates that cultural adaptation can be achieved using various frameworks dependent on cultural preferences and resource availability.

Family-centered care is highly recommended to improve parent engagement and participation in pediatric settings (Dunst et al., 2007). Family-centered capacity building approach is widely adopted in early intervention services (*DEC Recommended Practices*, 2014) and in major practice guidelines ("Individuals with Disabilities Education Improvement Act Regulations," 2004). Family-centered capacity building approach provides families with knowledge and skills (Dunst et al., 2016), engages families by participatory opportunities and experience aiming at strength-building, and promotes new parenting skills development that enhances parental self-efficacy (*DEC Recommended Practices*, 2014; Dunst et al., 2007). Mediated parent learning through guided video reflection is a strategy that involves guided reflection on parent-child interaction, it aims to leverage the parents' existing knowledge, encourage new conceptual learning, and assist parents' awareness of their capacity to support child learning (Schertz & Horn, 2017; Schertz et al., 2018). It has been reported that Chinese parents lacked general knowledge about autism (S. Su et al., 2021), which led to a reluctance to seek help (Huang et al., 2013; Sun et al., 2015). Providers in China viewed parents being hesitant or incompetent to engage in their child's early intervention service (H. Su et al., 2021). The

evidence from current literature suggests the significance of the parental capacity building and conducting family-centered intervention in China.

Early Start Denver Model (ESDM) is an early intervention model based on the developmental and behavioral approaches developed in the US (Rogers & Dawson, 2010), it has shown great effectiveness to improve cognitive, adaptive, and autism symptoms for children with autism (Dawson et al., 2010). The parent-mediated ESDM (P-ESDM) focuses on teaching parents intervention strategies to create a positive social interaction environment between children with autism and their caregivers (S. Rogers et al., 2012). Previous research has established that ESDM has great potential to be implemented in contexts that are different from its original context. Colombi et al. (2018) implemented ESDM in an Italian community and concluded that ESDM would have a positive impact in a non-English-speaking community. Holzinger et al. (2019) reported the feasibility of low-intensity ESDM in a community setting in Austria. One intervention strategy, the use of exaggerated affect, was modified by using culturally more appropriate body language, because it was regarded as unnatural by most parents and practitioners in Austria. Similar studies examining the efficacy of ESDM were conducted in Japan (Tateno et al., 2021) and China (Gao et al., 2020) both in clinical settings, but no data of cultural adaptation was provided. Two studies reported cultural adaptation when examining the effectiveness of P-ESDM on preschoolers with autism in mainland China. Xu et al. (2017) conducted a pilot study examining the efficacy of an 8-week ESDM plus other eclectic intervention services delivered by local teachers. They used the translated ESDM manuals and culturally more appropriated activities for the treatment group. According to Resnicow et al. (2000)'s cultural sensitivity model, their adaptation involved surface-level changes in materials and activities of P-ESDM to fit the Chinese population and deeper structural adaptation by

combining P-ESDM with local eclectic services (e.g., speech therapy, occupational therapy, sensory integration, music therapy, and play therapy). B. Zhou et al. (2018) conducted a non-randomized trial to compare a 26-week, high-intensity, P-ESDM intervention with a general community-based treatment program using the Chinese version of P-ESDM. Detailed information about adaptation was not provided. Both studies showed positive feasibility for the adoption of P-ESDM in a 1-on-1 clinical in-person setting.

Taken together, the present study used the theoretical models of Ecological Validity for cultural adaptation and family-centered capacity building for intervention development. The study focused on translating P-ESDM into a culturally appropriate telehealth intervention for families with a newly diagnosed child in mainland China. This telehealth intervention was designed to educate parents on evidence-based intervention techniques so that parents could stimulate their child's progress at home while waiting for more intensive treatment. The telehealth intervention served with two conditions: the self-directed and the web + group therapy. Parents in the self-directed condition received intervention individually through the web-based learning platform. Parents in the web + group therapy condition (treatment) navigated the same online program as the self-directed condition (comparison) with a weekly 1.5-hour group coaching therapy via videoconferencing. Family-centered capacity building approach and structured guided reflection were adopted to guide the development of group-based coaching sessions. The findings of this study may serve as an example for clinicians to adapt existing EBPs and to develop practicable group-based interventions in the future.

The aims of the study were to culturally adapt P-ESDM using the Ecological Validity Model and the family-centered capacity building approach, as well as to test the feasibility of conducting a randomized controlled trial of such a modified telehealth program with two

telehealth service conditions in the Chinese community. The report on cultural adaptation progress and feasibility results, including recruitment, retention, and participation, would inform the prospect of conducting a definitive trial in the future.

2.2 Methods

2.2.1 Step 1: Cultural Adaptation

Bernal et al. (1995)'s Ecological Validity Model (EVM) and the family-centered capacity building approach (Trivette & Keilty, 2017) were used to determine "what" to adapt and "how" to adapt. Eight dimensions in the EVM were assessed to ensure the fit in the intervention content and telehealth delivery. Metaphors, concepts, and goals stayed as original P-ESDM. For example, we still used the P-ESDM concepts and goals which based on the behavioral and developmental principles. We emphasized to set families goals which not only focused on facilitating child development but also promoting the well-being of the parents. Five dimensions were determined to modify: language, persons, content, methods, and context.

2.2.1.1 ***Language***

Culture is carried by language. We ensured the language in this telehealth intervention is understandable, culturally appropriate, and culturally syntonic. We compared the language of the Chinese edition to the original English version of the book, "An Early Start for Your Child with Autism – Using Everyday Activities to Help Kids Connect, Communicate, and Learn". The key points of each chapter were extracted and included in the presentation slides. Terminology regarding child development and ESDM techniques or strategies was identified and provided supplementary explanations and examples. Some technical translations that did not accurately represent the original English texts were retranslated and replaced. Special efforts were made to

ensure the cultural syntonic language when delivering the key principles of P-ESDM, especially to Chinese families that might originate from diverse ethnic, cultural, dialectal, and traditional backgrounds.

2.2.1.2 *Persons*

The persons dimension in the EVM referred to the relationship between patient and the therapist. Therapists with a similar cultural background are recommended in order to create the patient-therapist fit. Meanwhile, the family centered care focuses on building the capacity of families. A collaborative model of service delivery should be established to engage families in their natural environment. Therapists need to put aside their "expert role", listen and work with the family as a team. Several principles should be applied in order to build an effective relationship. First, therapists should consider the dimensions of family (family traditions, cultures, values and beliefs) as well as other factors which may contributes to the family diversity, such as socioeconomic status, occupation, and ethnicity. Second, therapists should respect the family's dynamics, lifestyle, and commitments; respect the level of involvement that the family chooses to take, because building family's capacity takes time. Third, therapist should remember that changing the child's routine can impact the routine of the entire family and communicate in a family-friendly manner with feasible suggestions.

2.2.1.3 *Content*

The content dimension in the EVM referred to cultural knowledge of the practice. Additional knowledge and scientific evidence were necessary to prepare the Chinese parents for learning P-ESDM remotely because the ongoing autism stigma (Liao et al., 2019; Yu et al., 2020; T. Zhou et al., 2018) and inadequate health education resources in China. Essential topics

included autism, child development, parents' mental health and coping strategies, as well as how to participate the telehealth intervention. Furthermore, home-based intervention activities should be integrated into typical family interactions, and they should be culturally appropriate and acceptable to most Chinese families.

2.2.1.4 *Methods*

ESDM is based on the methods of applied behavior analysis and developmental principles. It aims to use play and daily activities to build a positive relationship and create learning opportunities for children with autism (Rogers & Dawson, 2010). The culturally adapted learning materials should focus on educating Chinese parents about intervention strategies and how to implement them at home. In addition, the adapted learning materials should be able to incorporate into telehealth service delivery. In addition, the tailored feedback aimed to increase parental competence and confidence in selecting, implementing, modifying, and evaluating learning opportunities for their children with autism at home (Ottley et al., 2017).

2.2.1.5 *Context*

The contextual issues were relevant to the treatment process in the form of examples, the service delivery model, or social elements such as acculturative stress, social support, family relations and preference. The present telehealth intervention applied two service formats, a self-directed digital learning condition that connected people to the training and a plus version with synchronous group-based parent coaching therapy, which connected people to people (professionals and peers). Two communications or information systems were used, the Canvas online learning management system and the DingTalk, the Chinese videoconferencing software. For the self-directed digital learning, all learning materials were structurally organized in the

program Canvas website. The weekly group coaching sessions were delivered via DingTalk. Both Canvas and DingTalk were used for the communications between the therapist and the parents.

2.2.2 Step 2: Feasibility Study

2.2.2.1 ***Study Design***

A randomized controlled trial was conducted to test the feasibility of conducting this culturally adapted telehealth intervention in China. The feasibility study mainly aimed to answer the question "Can this study be done as planned?" (Abbott, 2014; Arain et al., 2010; Eldridge et al., 2016; Orsmond & Cohn, 2015). The recruiting process and capability, retention, and parents' adherence and participation were reported as the feasibility outcomes. The study received ethical approval from the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00182526).

2.2.2.2 ***Participants Recruitment and Consent***

Chinese families of children with autism were recruited through the Internet. A digital recruitment flyer was created for distribution to parent groups and community service providers. One non-government ASD institution, one rehabilitation hospital, and several online parent groups in China were reached out to distribute the digital recruitment flyer. The digital recruitment flyer included a brief description of the study and a QR code that directed families who were interested to the recruitment page. When potential participants entered the recruitment page, they were provided with a detailed description of the study and a Qualtrics link to the Recruitment Portal. The Recruitment Portal served three major roles: eligibility screening, consent, and randomization questionnaires.

The inclusion criteria for participating in the feasibility study were: (1) parents over the age of 18, (2) with a child aged 2-5 years old at entry, with a diagnosis or a strongly suspected diagnosis of ASD made by a psychiatrist within 6 months, (3) with access to the Internet and a digital device to receive the web-based intervention, and (4) the participating child met or exceeded cutoff scores of 10 (social interaction), 8 (communication and language), and 3 (restricted and repetitive patterns of behavior or interest) on the Autism Diagnostic Interview-Revised (ADI-R) (Lord et al., 1994).

Exclusion criteria were: (a) parents attending another parenting program during the intervention phase; (b) children with genetic defects or inherited diseases (e.g., Rett Syndrome, Fragile X Syndrome); (c) children with physical or sensory disabilities; (d) family in crisis (e.g., the child at risk of residential placement); (e) refusal to give consent to take part in the research. There were no exclusion criteria based on co-occurring intellectual disability.

We contacted parents via emails and texts to confirm their consent to participate after they digitally signed the consent and completed the randomization questionnaires in the Recruitment Portal. Each family was scheduled for a 1.5-2 hours virtual meeting for the ADI-R (Lord et al., 1994) and to address any potential study questions. The ADI-R interviews were conducted by a trained therapist who completed the ADI-R clinical training.

2.2.2.3 *Randomization*

Simple randomization based on a computer-generated random group sequence was used to allocate participants to a particular group. The randomization process was done by a Ph.D. student with no affiliation to this study.

2.2.2.4 *Procedures*

After the confirmation of informed consent via virtual meeting, thirty-seven parents were successfully enrolled either in the treatment (web + group therapy) or comparison group (self-directed). Before the intervention started, baseline assessments were distributed to parents along with a Program Workbook. The program workbook consisted of three parts, (1) Participant profile, (2) Picture tutorials for the use of Canvas and DingTalk, and (3) General guidelines of discussion group: rules & etiquette. Part 1 informed participants of their assigned de-identified participant number and invited code to enter the program Canvas site, a program schedule, and a copy of the signed consent. Part 2 contained step-by-step picture tutorials about how to use Canvas and DingTalk in terms of App downloading, registration, and Chinese language setting. Part 3 listed ground rules for language use in posting and replying to the Canvas Q&A discussion session. Specifically, participants in the treatment group were provided with guidelines for discussion and a checklist for the participation of virtual group sessions including hardware preparation (i.e., device, electricity, earphones, mic, and internet connection), environment (i.e., camera background, light, noise, and privacy), and confidentiality.

After being allocated, parents in the treatment (web + group therapy) and comparison (self-directed) groups self-navigated the program. Table 2.1 displays the structure of a weekly schedule for both conditions during the intervention. Specifically, new modules were released on Mondays including pre-recorded lectures, demonstration, and commentary videos, along with a practice manual and a module-specific assignment. The assignment for each module was due on Fridays, and those who chose to submit it received written tailored feedback on Sundays. Parents in the treatment group received group agenda on Fridays and participated the group therapy on Saturdays via DingTalk. The treatment group was divided into three subgroups based on parents' availability and preference. Each subgroup contained 6 - 7 parents to ensure full participation

and followed the same discussion agenda. The intervention consisted of 12 modules over 12 weeks, and post-intervention assessments were distributed and collected immediately after the intervention. After that, parents from both groups had an additional one month to access the program. Follow-up assessments were collected 1 month after the post-intervention.

2.2.2.5 *Measures*

Demographics

Basic demographic information was reported by parents including age, sex, education level, employment status, family income, and structure, as well as the age and gender of participating children with autism.

Feasibility Outcome Measures

Recruitment rate and retention. The recruitment process was evaluated in terms of (1) access to participants (i.e., the response of participants to advertising, the proportion of respondents who meet the eligibility criteria); (2) barriers to participation (i.e., the proportion of respondents who do not meet the eligibility criteria); (3) recruitment rates per week; and (4) willingness to be allocated to the treatment group by randomization. Recruitment rate, retention rate, and differential retention rate were calculated. The recruitment rate is calculated as the total number of patients recruited divided by the maximum number of sites recruiting, then divided by the total number of months that the trial recruited for. Retention rate is defined as the proportion of people providing the outcomes by the proportion of randomly assigned units. Differential retention rate is the difference in the proportion of people providing the outcomes in the treatment group and comparison group.

Adherence and Participation. Participants' adherence to the program was assessed through their activities data from the Canvas site in terms of *Page Views* and *Participations* (i.e.,

times of homework submission, times of comments posting in the Q&A session). Participation was evaluated by *Homework Submission Rate* and *Total Number of Video clips submitted*. Attendance of weekly group therapy was recorded.

2.2.2.6 *Data Analysis*

Independent t-tests and Pearson's $\chi 2$ tests were conducted to test the group difference in baseline participants' demographic characteristics. The descriptive statistics including mean, standard deviation, percentage, mode, and range were calculated and reported in groups for the feasibility outcomes.

2.3 Results

2.3.1 Step 1: Cultural Adaptation and Learning Materials

Ecological Validity Model was used to guide adaptation and documentation in this study, and the following modified aspects are presented.

2.3.1.1 *Language*

We created the intervention website and learning materials in simplified Chinese, such as module-specific slides and practical manuals. The group-based coaching sessions were delivered in Mandarin (Putonghua). Specifically, lay language was used in all learning materials, supplementary descriptions of concepts, principles, and terminology were provided. For example, we provided the additional definition and stages of social play in Module 9 – Play to help parents understand better the developmental stages. We gave alternative descriptions of daily activities and routines that are more recognizable to Chinese parents. For example, child's role and responsibility during family mealtime was introduced with Chinese culture. Moreover, idioms that reflect both ESDM core concepts and Chinese values were used to help parents

understand better. For example, we used proverbs “家和万事兴” (If the family lives in harmony, all family affairs will prosper) to help parents understand the importance of relationship between parents and the child. Embedded captions and Chinese subtitles are available for all the video learning materials. In addition, the Chinese version of the book “An Early Start for Your Child with Autism – Using Everyday Activities to Help Kids Connect, Communicate, and Learn” is provided as the reference book.

2.3.1.2 *Persons*

In the present study, a licensed physical therapist who was born and raised in China, is familiar with Chinese culture and customs, and has worked with Chinese families with children with autism in clinical and school settings delivered the intervention. The therapist completed ESDM introduction and advanced trainings and delivered the program under the supervision of a senior licensed ESDM trainer who is also a clinical psychiatrist. With the aim to build trusting and respectful partnerships with the family, the therapist presented families with up-to-date and unbiased information, was responsive to their concerns and priorities, and encouraged their engagement by explicitly highlighting their strengths. For example: when giving suggestions to parents, the therapist always reminded parents that they knew their child best, as well as their daily routine. The therapist stated: “Here are some strategies you could try the next time, please choose the one that works best for you and your family.”

2.3.1.3 *Content*

The program content of the 12-module telehealth intervention adopted the 10 topics in P-ESDM (Vismara et al., 2009; Vismara et al., 2013; Vismara et al., 2016; Vismara et al., 2012). Each module covered one of the following topics: (1) Autism and what to expect, (2) Increasing

the child's attention, (3) Sensory social routines, (4) Dyadic engagement, (5) Nonverbal communication, (6) Imitation, (7) ABC's of learning, (8) Joint attention, (9) Play, (10) Pretend play, (11) Speech development, and (12) Program summary (See Appendix A: Program Content). We provided Chinese parents with a warm-up and a summary module to start and end the intervention. We introduced the telehealth program workflow through video tutorials to assist parents to navigate the program. The most recent scientific evidence on autism and typical child development milestones was presented in two lectures. Typical developmental milestones in all domains were provided from one to five years old, along with early red flag signs at each stage. Another lecture on the parents' mental health and coping strategies was highlighted in the first module. The last module of the telehealth program included program review and summary (See Appendix A: Program Content).

For the purpose of being culturally sensitive and responsive, we chose activities that are most recognizable across Chinese families from different regions, such as bedtime, mealtime, self-care, and dressing routines, and advised parents to use available supplies (i.e., cups, tapes, pillows, sheets) at home to avoid issues in the absence of a toy. For example, we suggested finger games "炒萝卜" (stir-fry the radish), sensory motor game "摇到外婆桥" (a nursery rhyme when you sway your child) using bed sheets, and so on. The home-based flexibility was highlighted to empower parents and build strength (Pickard et al., 2021), as well as to ensure the core elements of P-ESDM were not inhibited by taking into account the family's current resources (i.e., availability of toys).

In our study, we emphasized the intervention strategies of gesture use and action imitation, particularly given the age range of the participants (Talbott et al., 2018). We encouraged parents to label children's actions (Chan et al., 2011), use consistent gestures, and

create meaningful action cues during the face-to-face interaction. Activities such as gross motor games, finger games, singing songs, and dancing were presented as examples and recommended in the practice manuals.

2.3.1.4 *Methods*

We created a program website using the Canvas online learning management system to deliver P-ESDM learning materials. Four types of learning materials were developed for each module with the aims to fit the knowledge level and demands of Chinese parents, as well as to fit the telehealth delivery. They were lecture, demonstration, and commentary videos, as well as practice manuals.

Asynchronous video-based learning materials were created in the form of lecture, demonstration, and commentary. Lectures were pre-recorded videos with PowerPoint slides that emphasized the comprehension and execution of intervention strategies for young children with autism. Demonstration videos were authentic video vignettes of parents interacting with their children while implementing intervention strategies. We chose culturally appropriate home activities that were demonstrated by families of all races and ethnicities. We intended to show autism variability in the demonstrations which could create a sense of belongings and help Chinese parents incorporate intervention strategies into their regular household activities. Commentary videos highlighted the timing and key characteristics of the practices in the demonstration. We used “voice-over” to explain the strategies used in the demonstration and “pause and reflect” to help parents understand “why” this strategy was chose and “how” to read child’s behaviors. All the learning videos had a Chinese subtitle or captions. In addition, each module provides a practice manual with instructions and reflection questions to assist parents practice at home utilizing the available resources.

Apart from the learning materials, an online Q&A discussion was embedded in each module on the Canvas website for parents to ask questions or share their experiences. Each module included a video homework for parents to submit voluntarily. Parents who submitted the video-clips of their practice at home received tailored feedback from the therapist. Written feedback was based on individual performance in their practice at home with their child. We purposefully drew parents' attention to their effective use of intervention strategies during their parent-child practice, taught parents to recognize subtle signs and behaviors in their children, and suggested strategies that may work in similar contexts. For examples, we acknowledged parents' efforts, "You prepared extra toys for Tom to choose from, that is excellent!". We pointed out the correct use of intervention strategies, "I see you placed Jenny on her chair so that her eyes' level is at the same level of yours, and the back of the chair give her support. she is making beautiful eye contact, well done!". We explained child's response to parents, "Jerry starts to smile when you imitate his actions!", "You still hand over the car to Henry after he screams, that's how he learns that screaming could bring things he wants". We suggested strategies for next opportunity, "Next time when Mike reaches for the objects, you could wait a few seconds to see if he could use other communicative gestures".

Weekly group coaching sessions were synchronous guided group reflection via videoconferencing. We created module-specific group agenda (Appendix B) for the participation in group-based parent coaching sessions.

2.3.1.5 *Context*

This telehealth intervention was delivered through a program Canvas website. The weekly group therapy sessions were delivered via DingTalk, the videoconferencing software. Each session lasted 1.5 hours and followed a structured agenda.

All the learning materials presented in the program Canvas website highlighted the P-ESDM principles as well as the home-based setting. We chose home activities or games which could be integrated in family's bedtime, mealtime, self-care, and dressing routines. We encouraged parents to use existing resources or toys at home. Lectures videos were multiple short videos with embedded slides and scripts. Demonstration and commentary videos were short video clips focused on the intervention strategies. The module-specific practice manual adopted P-ESDM topic goals and strategies (Vismara et al., 2016), but elaborated with instructions and reflection questions to facilitate Chinese parents practice at home. The parent coaching were mainly through family self-reflection (Trivette & Keilty, 2017) with the assistance from the commentary videos, practice manuals and homework feedback.

The other telehealth condition in current study was delivered in a group format. We used mediated parent learning principles to design the group-based coaching sessions. Mediated parent learning through guided video reflection is a strategy in the family-centered capacity building approach (Schertz & Horn, 2017; Schertz et al., 2018). It involves guided reflection on parent-child interaction and aims to leverage the parents' existing knowledge, encourage new conceptual learning, and assist parents' awareness of their capacity to support child learning. This strategy was adopted to design the weekly group therapy. Simplified module-specific group agenda with structured activities was created to avoid adding stress to families.

Specifically, the weekly group therapy sessions used a structural model based on mediated learning principles (Schertz & Horn, 2017; Schertz et al., 2018). During weekly virtual sessions, the therapist served as a moderator or facilitator to keep the dialogue focused on skill strengthening in the group. Video clips of parents' practice at home (homework submissions) were used to mediate learning techniques and build parents' capacity. As a result, parents in the

group generated their own learning by sharing successful experiences, reflecting on their own behaviors or intervention strategies use, and brainstorming as a group. Five group activities were applied in the weekly group sessions (modified from Schertz and Horn (2017)'s Table 5, see Appendix C). The weekly group therapy started with parents sharing their accomplishments or challenges from the previous week's practice. Then the therapist guided parent learning by commenting on the effective strategies used in the parent-child interaction videos. Following that, parents reflected on their own behaviors and techniques used at home and commented on each other. Next, parents in the group brainstormed together to come up with more activities that could integrate intervention strategies and translate them into daily routines (Appendix B: Weekly Group Agenda).

We provided parents with a program workbook to assist them participate in the group-based coaching sessions. General guidelines of discussions in the group were highlighted in rules and etiquette. We created a checklist for parents to complete before attending the virtual meeting, emphasizing three major parts: hardware preparation, environment, and confidentiality. We created a group session template for parents to take notes (Appendix D: The Structure of Parent Group Therapy Session-Template). In order to establish a peer learning environment, we encouraged parents in the same group to take turns sharing their notes.

Take together all the dimensions modified; a 12-module telehealth intervention was developed. Table 2.2 shows the numbers and duration of video-based learning materials on the program Canvas site. Each module covered one topic with asynchronous videos in the form of lecture, demonstration, and commentary. Each module contained an average of 45 minutes lectures videos and the average duration for demonstration and commentary videos each module

was approximately 6 and 19 minutes, respectively. The total duration of the learning materials per week ranged from 54 to 92 minutes, with a mean of 71 minutes.

2.3.2 Step 2: Feasibility Study

2.3.2.1 *Baseline Demographic Characteristics*

Table 2.3 presents the baseline participants' characteristics. Group differences at baseline were examined using independent t-tests for continuous variables and Pearson's $\chi 2$ tests for categorical variables. No significant difference was found at baseline. The majority of participating parents were mothers (86.49%), 4 fathers (10.81%) took part in the program. The age range of the participating children was between 1.68 – 5.16 years old at entry, with a mean of 3.21. 86% of the children were boys (32/37) and 14% of them were girls (5/37). Nearly two-thirds of families (64.86%) lived under a three generations structure, while less than a third of families (27.03%) lived in a nuclear family. 43.24% of families reported a monthly family income below $1540, while 21.62% of families reported a monthly family income of above $3080.

2.3.2.2 *Feasibility Outcomes*

Recruitment and Retention

Figure 2.1 and Figure 2.2 show the CONSORT (Consolidated Standards of Reporting Trials) diagrams of the participants flow through each stage of the study. Specifically, Figure 2.1 illustrates the recruitment, consent, and enrollment, and Figure 2.2 shows allocation, follow-up, and analysis. The recruitment portal was accessible between June 24 and July 7, 2020. During these two weeks, there were 2,204 views on the Recruitment page and 379 logins in the Recruitment Portal. 97 families were qualified for participation after the eligibility screening,

while 282 were excluded. Among these excluded, 10.5% were either not interested or not meeting inclusion criteria, and 89.5% were excluded for other reasons including attending other programs at the same time, having other genetic diseases, and physical or sensory disabilities. The digital consent required potential participants to both agree to participate and sign digitally. 74 parents agreed to participate, and 67 of them both agreed and signed. The recruitment rate was 33.5 per week.

Those who completed the digital consent were directed to fill out the randomization questionnaires and provide their contact information. All sixty-seven families agreed to be randomly assigned to the treatment group. However, one parent (1.5%) reported their unwillingness to participate in weekly group sessions (treatment group) because they did not like the group learning environment. Four families (5.9%) expressed concerns about their availability to participate in weekly group sessions, stating childcare, work, and a lack of family support as reasons. Fifty-four digital consents were confirmed by emails or text messages, due to the research capacity, forty-four families were randomly allocated (See Figure 2.1).

Figure 2.2 shows the participant flow after enrollment. 22 parents were randomly assigned to the web + group therapy (treatment) group and 22 to the self-directed (comparison) group. 7 participants declined to enroll before the intervention started, reasons were time conflicts (3/7), privacy concerns (1/7), work (1/7), and pregnancy (2/7). As a result, 37 participants were successfully allocated to the program. 8 participants (6 from the comparison group and 2 from the treatment group) were lost from follow-up. Retention was 86.5% at post-intervention and 78.4% at 1-month follow-up. Specifically, the retention rate at 1-month follow-up was 89.5% for the treatment group and 66.7% for the comparison group, differential retention rate at 1 month follow-up was 22.8%. We lost contact for most cases of dropouts during the

intervention. However, two parents (one from the self-directed, one from group therapy) indicated being unavailable for the follow-up assessments due to work. In addition, 50% of parents in the self-directed condition completed the intervention, and 90% of parents in the web + group therapy condition completed as planned at post-intervention.

Participation and Adherence

The website activity data was exported from the program Canvas site. However, the data was inflated due to the technical issues with the Canvas app and the local broadband speed. For example, parents reported multiple attempts to view the lecture page, which resulted in inflated data in Page Views. Due to the overall inflated "noise" in Canvas website data, the median scores of participants' Total Page Views and Participations during the 12-week intervention were reported in Table 2.4.

More specifically, the line graphs of the Weekly Page Views (Figure 2.3) and Participations (Figure 2.4) showed the pattern of learning activities between groups.

Figure 2.3 shows the weekly total and average page views by group during the intervention. For the web + group therapy condition, the total amount of page views stayed steady for the first six weeks of the intervention between 1547 (Week 4) – 1962 (Week 6), and it declined from Week7 (1241) to Week 10 (704) and went up to 892 page views at Week 11. It dropped again at Week 12 (545) and continued to decrease after the intervention. During the follow-up stage of the intervention, the total page views stay around 110 from week 13 to Week 15 and increased to 376 at Week 16. The total amount of page views in the self-directed condition was stably above 1000 for the first eight weeks with two peaks at Week 2 (1436) and Week 4 (1438). It dropped sharply to 382 at Week 9 and increased slightly to 449 at week 10. It rose steeply to 1121 at Week 11 and decreased again to 247 at Week 12. During the follow-up

stage, the total page views in the self-directed condition stayed between 196 and 537. The average page views in the web + group therapy condition were about 2-6 times higher than the self-directed condition across the intervention.

The design of this telehealth program required participants to unlock each week's learning materials by completing the previous week's learning objectives. In addition, participants were encouraged to post questions or share their learning experience at the *Q&A session*. Each week there was a video homework to submit (optional). Activities mentioned above counted as *Participations*, the average *Participations* (times per person) from Week 2-Week 11 ranged from 1.8 to 4.2 times per person in the web + group therapy condition, and 0.9-2.1 in the self-directed condition (Figure 2.4).

Table 2.5 displays the characteristics of homework submissions. Overall, both groups showed a similar pattern with a relatively high submission percentile throughout the first five weeks. After that, the percentage of people who submitted homework decreased over time, particularly in the comparison group. The range of homework submissions in the treatment group was larger than the comparison group, while the mode was the same most of the weeks. Furthermore, the treatment group's attendance rate for group therapy sessions during the intervention stayed relatively high ranging from 78%-100%, with a mean of 92% (Figure 2.5).

2.4 Discussion

The present study used the Ecological Validity Model to culturally adapt the Parent-mediated Early Start Denver Model for Chinese parents of children with autism. Five dimensions in EVM including language, person, content, methods, and context were modified. The family-centered capacity-building approach was used to guide the development of the group-based parent coaching intervention via videoconferencing. A 12-module digital parent coaching

program was created and delivered through the Canvas program website. 63 lectures, 75 demonstration videos, 53 commentary videos, along with 11 practice manuals and 11 group agendas were developed. The current study investigated the feasibility of delivering a group-based parent coaching intervention through videoconferencing. Two conditions, the self-directed and the web + group therapy, were compared. The trial presented promising feasibility results in terms of recruitment capability, retention, parental adherence, and intervention participation. High rates of attendance and intervention completion were observed in the treatment group. The findings of this feasibility study show important implications for the planning and execution of a full-scale RCT.

Cultural adaptation of current evidence-based treatments for families of children with autism in underserved communities is essential and greatly needed, because EBT focus on social communication or speech development involves culturally relevant plays and daily routine. Senzaki and Shimizu (2022) found that there was a significant cross-cultural difference in children's attention after parent-child interaction. Children's attention was directed to culturally sensitive material by caregivers. American children's attention was shifted to primary objects, whereas Japanese children's attention was shifting to the background. Although one of the key strategies of ESDM is child-led activities, we could not ignore the influence that social contexts have on development. The relationship between the development of social interaction and cultural diversity should be considered when delivering social communication interventions to a different cultural context. In our study, we recommended home activities that are most familiar to Chinese families and encouraged parents to use available materials at home to minimize problems if a toy is not accessible. Meanwhile, social interaction facilitates lexical and phonological development at the early stages of child language acquisition. Studies have

revealed different developmental patterns between English-speaking and Chinese-speaking children in early word learning (Tardif, 1996; Tardif et al., 1999), morpho-syntax acquisition (Huang, in press), and literacy development (Sun et al., 2022). For example, compared to English-speaking children who learn more nouns than verbs, Chinese-speaking children learned verbs more than nouns (Tardif, 1996; Tardif et al., 1999). Chan et al. (2011) found English learners at 18 months were able to link new labels to both actions and objects, while Chinese learners of the same age were able to map new labels to actions but not objects. Wu et al. (2020) found Chinese-speaking preschoolers with autism presented prolonged and atypical development sequences in phonological acquisition. In our study, we emphasized the intervention strategies of gesture use and action imitation, particularly given the age range of the participants (Talbott et al., 2018). We encouraged parents to label children's actions, use consistent gestures, and create meaningful action cues during the face-to-face interaction. One-word-up strategy (using speech that is one level higher than your child, a key principle in ESDM to promote speech development) as well as combining gestures with words were emphasized in our study.

Barriers to adapting and implementing effective EBP for children with autism and their families in underserved communities exist. Research on the culturally appropriate treatments for children with autism and their families on a global health paradigm has been mostly restricted due to limited science funding (Moran, 2016) and cultural heterogeneity (Lord et al., 2022). Harshini and Preeti (2017) stated that unique challenges in economic, ethical, and cultural dimensions hindered the development of a deliverable parent-mediated intervention in low-resource contexts. Furthermore, developing a culturally appropriate intervention is a time-consuming process, it involves the evaluation of cultural norms and family needs (Koslofsky &

Domenech Rodríguez, 2016; Kumpfer et al., 2008). The adaptation and implementation processes require global reporting and evaluation standards for more replication research.

Aside from the adaptation phase, the findings indicate the capability of digital recruitment. Within two weeks of recruitment, over 350 families expressed their interests in the study. Specifically, the exclusion criteria eliminated 89.5% of the excluded families. At least 69% (67/97) of all eligible patients could be recruited. All the families that consented to take part in the study agreed to be allocated to the treatment condition at random. However, in the allocation phase, 7 out of 44 parents declined to enroll before the intervention began. We followed up with these families to learn underlying reasons. One mother indicated the privacy concerns of group videoconferencing, three families were occupied due to pregnancy or work, and another three families indicated no time. This finding was consistent with previous findings that Chinese parents of children with autism were more likely to "wait and see" if their children outgrew autism symptoms or reluctant to seek treatment or professional help (Su et al., 2013; Sun et al., 2015)

High attendance (92%), high completion rate (90%), and low drop-out rate (10.5%) in the treatment group suggest that delivering small-group parent coaching via videoconferencing is likely to be feasible in the Chinese community. In contrast, 50% of parents in the self-directed condition completed the intervention at post-intervention and the differential retention rate at follow-up was 22.8%. A similar pattern was observed in previous telehealth parent interventions. For example, McGarry et al. (2020) reported a low completion rate in a parent education intervention, with only four out of the eleven enrolled parents completing all five online learning modules. Ingersoll and Berger (2015) found that having assistance from a therapist increased engagement and resulted in a higher completion rate. This might suggest that a low dosage of

assistance from therapists may support parents' engagement and completion. Future research or service providers need to explore strategies to promote parent engagement and completion rate for telehealth interventions.

Feasibility studies are described as "pieces of research done before to a main study" to determine if the essential components of the study can be completed within a specified time frame (Abbott, 2014; Arain et al., 2010; Bowen et al., 2009; Eldridge et al., 2016; Orsmond & Cohn, 2015). What we learned from the current study is that telehealth interventions place great demands on the Internet and heavily rely on technology. Although we provided a program workbook before the intervention, parents in our study experienced different levels of technical issues, such as unexpected app crushing, slow video downloading, and stream latency. The difficulties related to the learning platform and communication technology may limit parental participation and retention. The website activity data, to some extent, demonstrate the learning patterns of two conditions. Parents in the web + group therapy condition started with high engagement in the first six weeks, then their participation declined. However, the self-directed condition showed a more stable pattern throughout the intervention. Surprisingly, at least half of the participants chose to submit homework during most weeks of the intervention, even though we stated that homework submission was optional. Moreover, participants in both groups completed the outcome measures within a reasonable time limit. The findings mentioned above prove again that culturally appropriate interventions are more likely to have high parental engagement (Divan et al., 2015). Future telehealth studies or practices should consider ethical issues, such as information security and patient privacy. Internet-independent materials, such as print-outs or DVDs, should be created for families who do not have access to the Internet or a digital device.

2.4.1 Limitations

As a feasibility trial, the current study had several limitations. First, despite efforts to recruit families from a variety of demographic profiles, most participating families included parents with a college degree or higher. Families who did not have access to the internet or digital devices were excluded from the current study. Second, there was a consultation period after parents consented until the intervention began. The consultation schedule lasted for one month due to the time difference between China and the U.S. and limited personnel. This "waiting" period may influence the success of the allocation phase. Third, difficulties related to technology and Internet speeds resulted in inflated noise in the website activity data, which limited the interpretation of the digital program usage. Future telehealth studies should consider technology issues such as the availability of digital devices, App compatibility, and Internet speeds.

2.4.2 Conclusion

We aimed to develop a culturally appropriate parent coaching intervention to educate parents and enhance their parenting skills at the early diagnostic period of autism. The current study reported the intervention adaptation process, which resulted in a 12-week group-based parent coaching intervention delivered via telehealth and tailored to the Chinese context. This study also investigated the feasibility of conducting a randomized controlled trial to deliver such an intervention via videoconferencing. Promising results in recruitment, retention, and participation suggest it is feasible to deliver such a telehealth intervention in China. This study adds to the limited existing literature on cultural adaptation of a current evidence-based intervention for parents in underserved communities. The use of theoretical frameworks in intervention adaptation and development may serve as a reference for clinicians to adapt existing

EBPs in the future. The findings of this study provide support to a large-scale RCT in the future, methodologically rigorous RCTs are needed to establish the effectiveness of this culturally adapted intervention in low-resource communities.

Table 2.1 The Structure of a Weekly Schedule during Intervention

Day	Self-directed	Web + Group therapy
Day 1	Learning materials release and deliver through Canvas 1. Lectures 2. Demonstration and Commentary videos 3. A practice manual (Checklist & Recommended activities in home) 4. Homework (Optional)	
Day 2 Day 3 Day 4	Home-based learning and practice 1. Recommended activities & Family checklist	
Day 5		Homework due Group Agenda release Group Discussion preparation
Day 6		Group therapy sessions • 1.5 hours • 3 subgroups • 6-7 parents for a group
Day 7	Homework Feedback release	

Table 2.2 The Characteristics of Learning Materials

Module-Topics	Lecture		Demonstration		Commentary		Total	
	N	Duration (*h:m:s*)	N	Duration (*h:m:s*)	N	Duration (*h:m:s*)	N	Duration (*h:m:s*)
1 Autism and What to expect	5	1:19:19	0	-	0	-	5	1:19:19
2 Increasing the child's attention	5	0:26:20	13	0:14:40	8	0:20:48	26	1:01:48
3 Sensory social routines	5	0:26:20	12	0:09:34	10	0:29:36	27	1:05:30
4 Dyadic engagement	7	0:46:26	11	0:13:51	5	0:32:22	23	1:32:39
5 Nonverbal communication	6	0:53:20	10	0:07:54	8	0:25:55	24	1:27:09
6 Imitation	6	0:34:39	7	0:05:30	7	0:29:05	20	1:09:14
7 ABC's of learning	7	0:40:05	5	0:05:33	5	0:23:57	17	1:09:35
8 Joint attention	5	0:33:59	6	0:05:44	6	0:29:06	17	1:08:49
9 Play	3	0:35:15	1	0:02:49	1	0:16:01	5	0:54:05
10 Pretend play	5	0:25:41	3	0:06:06	3	0:30:41	11	1:02:28
11 Speech development	7	0:51:12	7	0:07:30	0	-	14	0:58:42
12 Program summary	2	1:29:57	0	-	0	-	2	1:29:57
Average	5.25	0:45:13	6.25	0:06:36	4.42	0:19:48	15.92	1:11:36
Total	63	9:02:33	75	1:19:11	53	3:57:31	191	14:19:15

Note. N, numbers of the videos; h:m:s, hour: minute: second

Table 2.3 Baseline Demographics

Characteristic	Self-directed (n=18)	Web + Group therapy (n=19)	Total (n=37)
Participating Parent, N (%)			
Mother	17 (94.44)	15 (78.95)	32 (86.49)
Adoptive Mother	0 (0.00)	1 (5.26)	1 (2.70)
Father	1 (5.56)	3 (15.79)	4 (10.81)
Intervention Completion ratio			
Sample ratio	50%	90%	70%
Child Age (years),			
Mean±SD	3.17±0.70	3.25±0.95	3.21±0.83
Range	1.68 - 4.62	1.70-5.16	1.68- 5.16
Child Sex, N (%)			
Males	16 (88.89)	16 (84.21)	32 (86.49)
Females	2 (11.11)	3 (15.79)	5 (13.51)
ADI-R, Mean±SD			
Social impairment	20.61 ± 3.57	19.16 ± 4.25	19.86 ± 3.95
Communication	10.94 ± 2.01	9.42 ± 2.81	10.16 ± 2.54
Repetitive interest	3.78 ± 1.73	3.32 ± 1.97	3.54 ± 1.85
Family structure, N (%)			
Nuclear Family	6 (33.33)	4 (21.05)	10 (27.03)
Three Generations Family	10 (55.56)	14 (73.68)	24 (64.86)
Single Parent Family	1 (5.56)	0 (0.00)	1 (2.70)
Others	1 (5.56)	1 (5.26)	2 (5.41)
Monthly Family Income, N (%)			
<460 Dollars	4 (22.22)	1 (5.26)	5 (13.51)
460-770 Dollars	0 (0.00)	3 (15.79)	3 (8.11)
770-1540 Dollars	4 (22.22)	4 (21.05)	8 (21.62)
1540-3080 Dollars	6 (33.33)	7 (36.84)	13 (35.14)
3080-7690 Dollars	4 (22.22)	4 (21.05)	8 (21.62)
Location, N (%)			
Urban	15 (83.33)	16 (84.21)	31 (83.78)
Rural	3 (16.67)	3 (15.79)	6 (16.22)
Mother's Education, N (%)			
High school or below	2 (11.11)	2 (10.53)	4 (10.81)
Junior college	6 (33.33)	6 (31.58)	12 (32.43)
Undergraduate	7 (38.89)	8 (42.11)	15 (40.54)
Graduate or above	3 (16.67)	3 (15.79)	6 (16.22)
Mother's Employment, N (%)			
Full-time	6 (33.33)	10 (52.63)	16 (43.24)
Part-time	0 (0.00)	1 (5.26)	1 (2.70)
Unemployed	11 (61.11)	7 (36.84)	18 (48.65)
Self-employed	1 (5.56)	1 (5.26)	2 (5.41)

Table 2.4 The Website Activity Data from the Program Canvas Website

	Self-directed Web (N=15)	Web + Group therapy (N=18)
Total Participations (Median)	30.0	34.5
Total Page Views (Median)	1,029	854

Table 2.5 Descriptive Statistics of Homework Submissions by Week: Mode (Range)

Mode (Range)	Week									
	2	3	4	5	6	7	8	9	10	11
Total (N=32)	1 (0-8)	1 (0-5)	1 (0-5)	1 (0-6)	1 (0-2)	1 (0-7)	1 (0-7)	1 (0-3)	0 (0-2)	0 (0-5)
Self-directed Web (N=15)	1 (0-3)	1 (0-4)	1 (0-3)	1 (0-3)	1 (0-1)	1 (0-2)	1 (0-1)	0 (0-2)	0 (0-1)	0 (0-2)
Submission percentile	73%	67%	67%	53%	53%	53%	53%	47%	47%	33%
Web + Group therapy (N=18)	1 (0-8)	1 (0-5)	1 (0-5)	1 (0-6)	1 (0-2)	1 (0-7)	1 (0-7)	0 (0-3)	0 (0-2)	1 (0-5)
Submission percentile	72%	89%	67%	78%	56%	61%	50%	56%	33%	61%

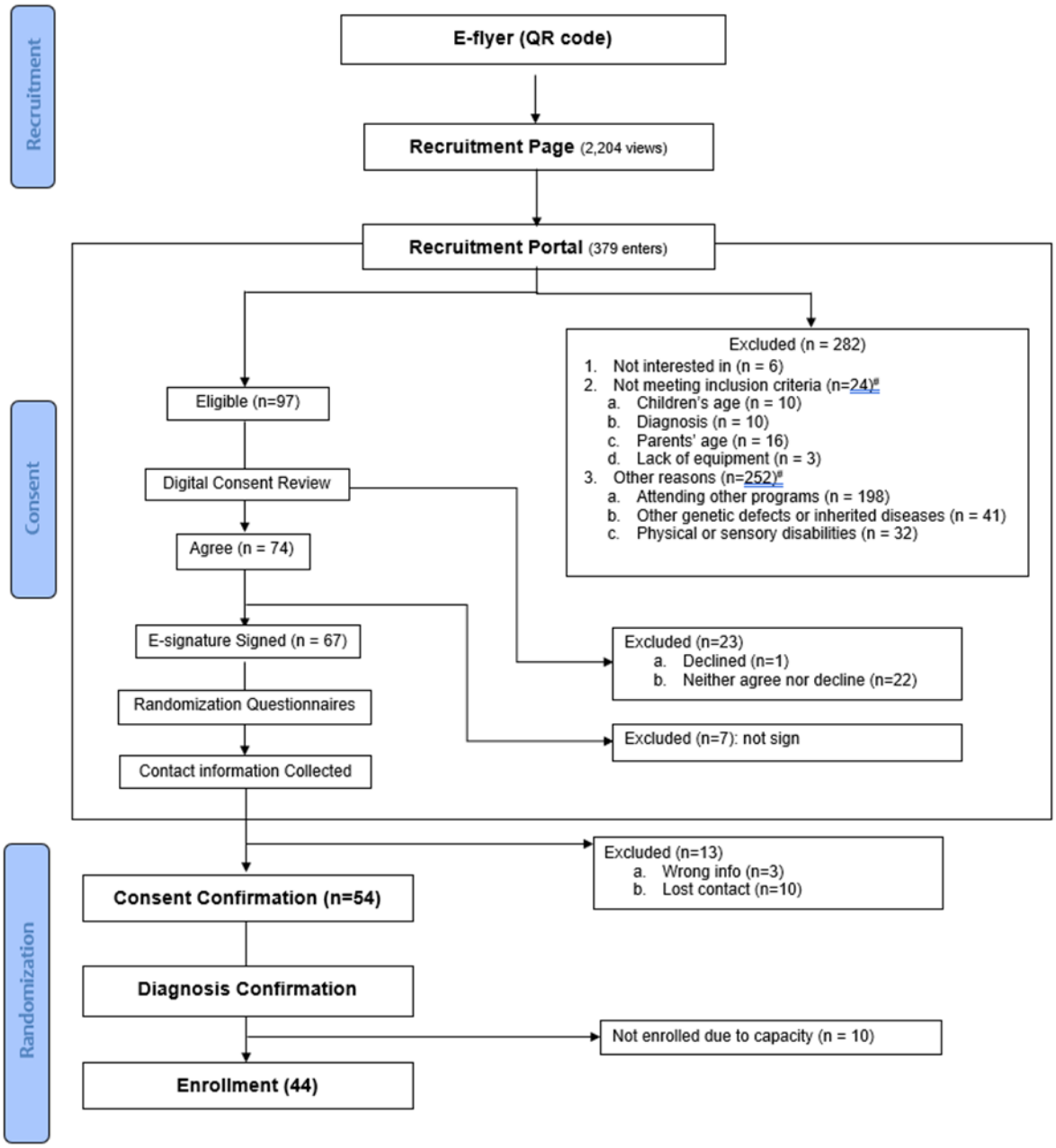

Figure 2.1 CONSORT Flow Diagram of the Recruitment, Consent and Randomization

Note: #: numbers of participants who did not meet the inclusion criteria overlapped by multiple reasons selected.

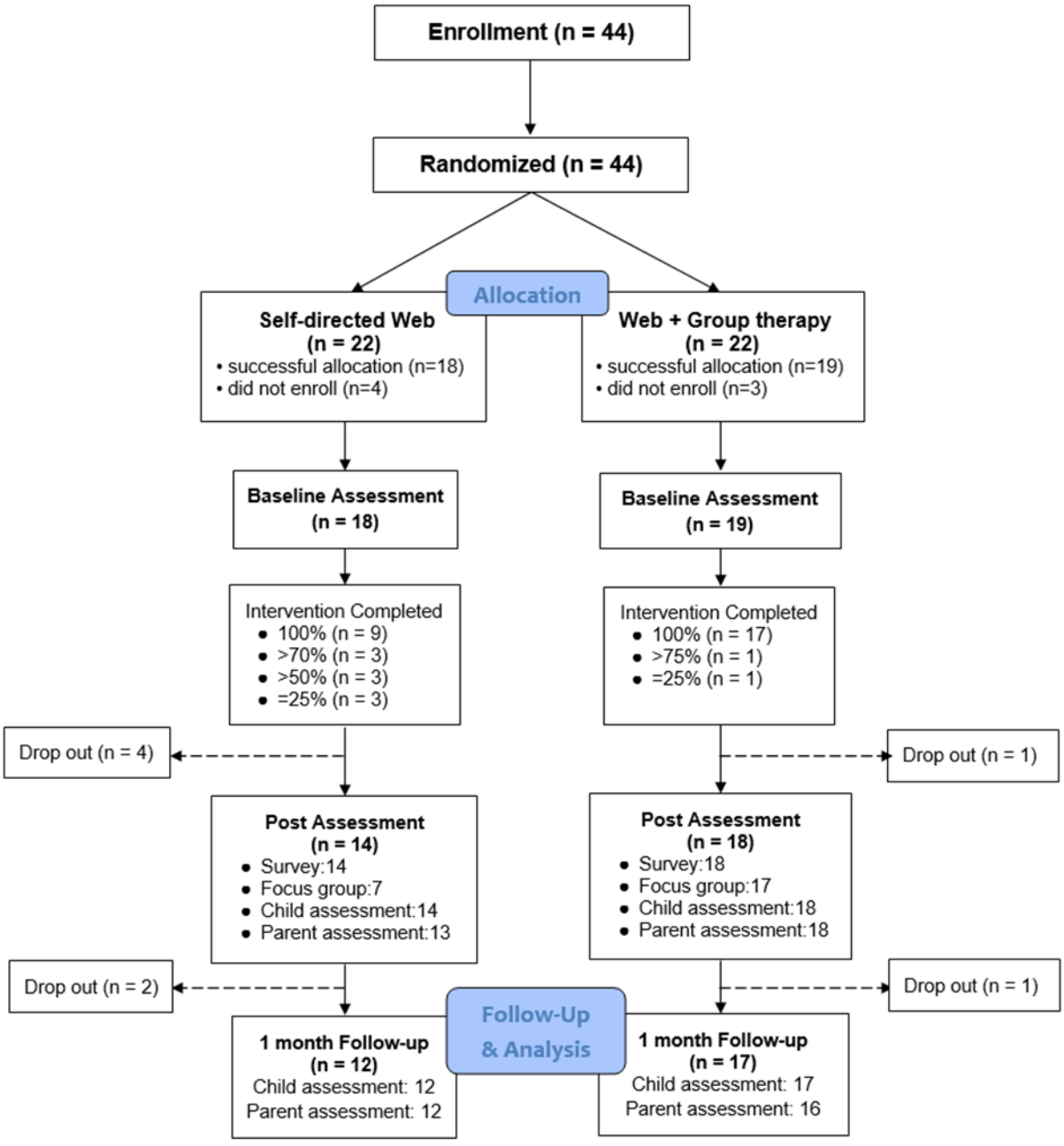

Figure 2.2 CONSORT Flow Diagram of the Enrollment, Allocation, Follow-up and Analysis

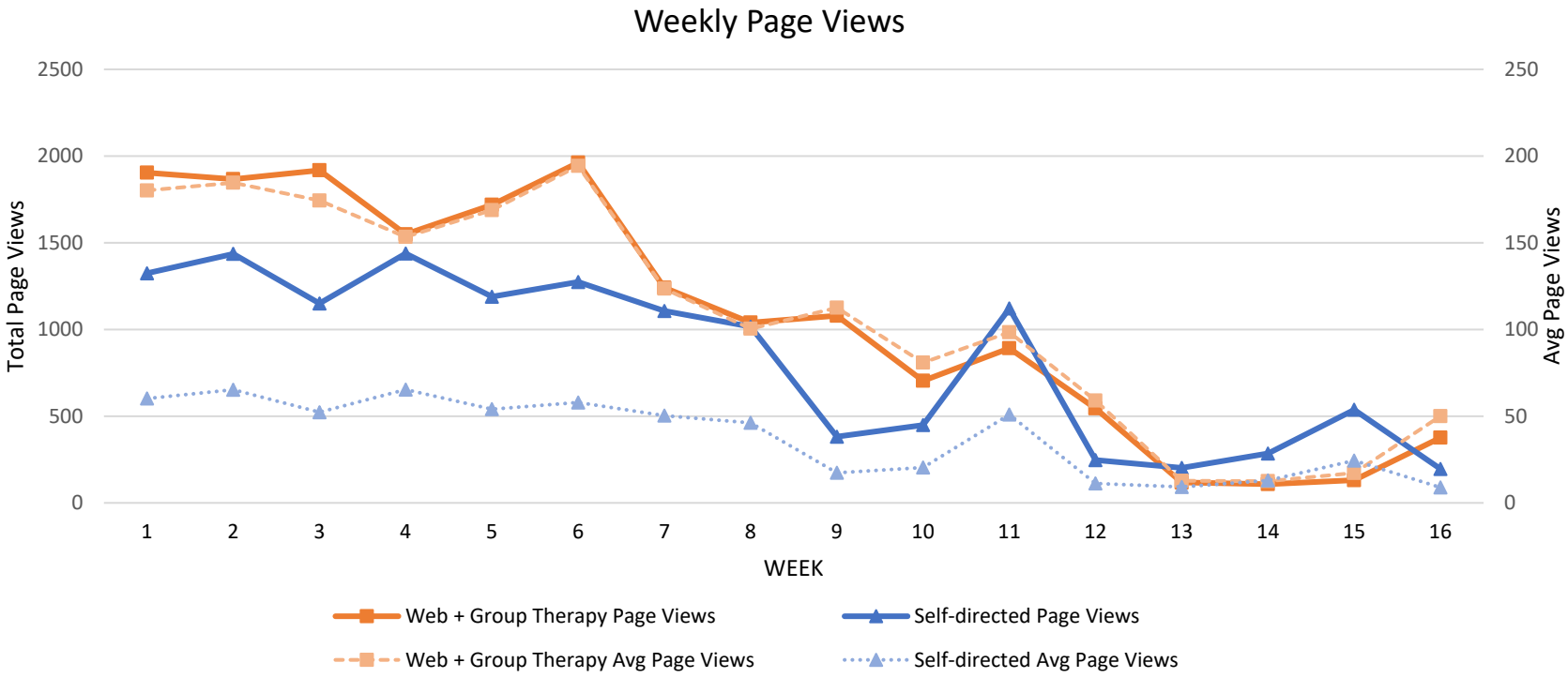

Figure 2.3 The Weekly Total and Average Page Views by Groups during the Intervention

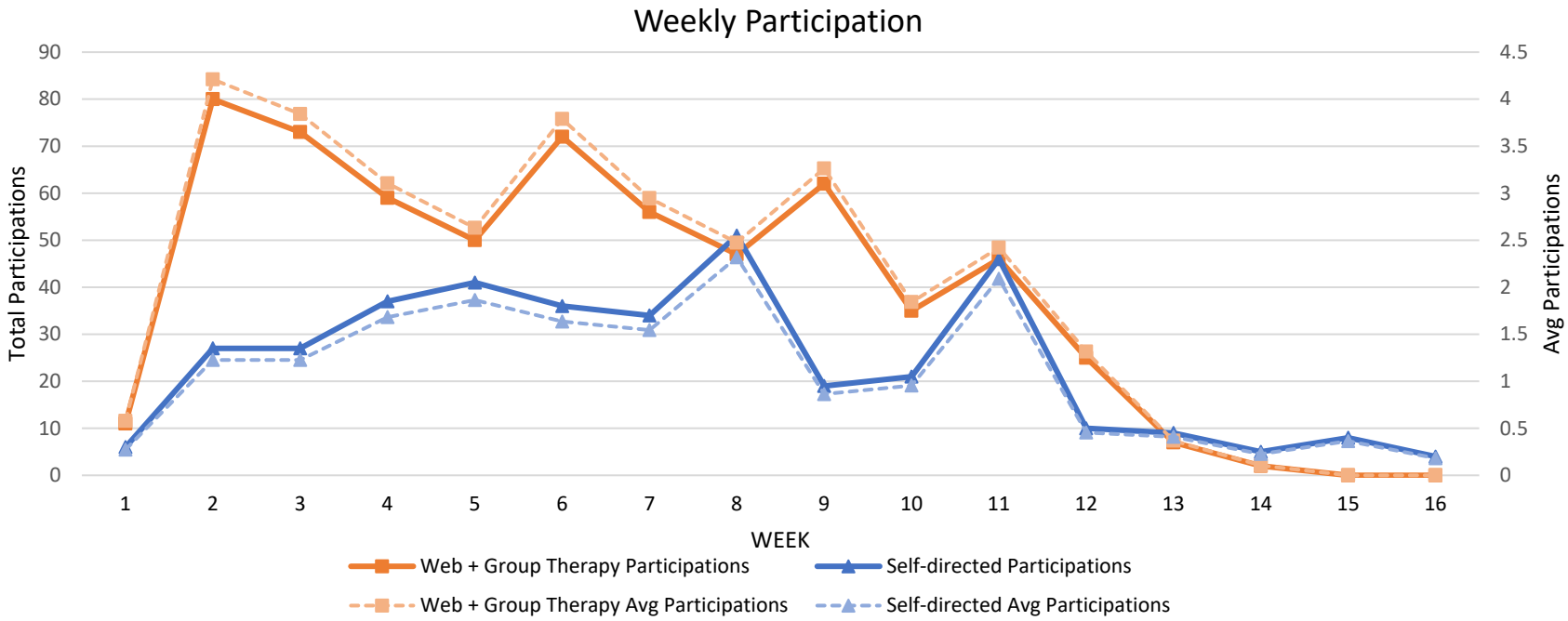

Figure 2.4 The Weekly Total and Average Participations by Groups during the Intervention

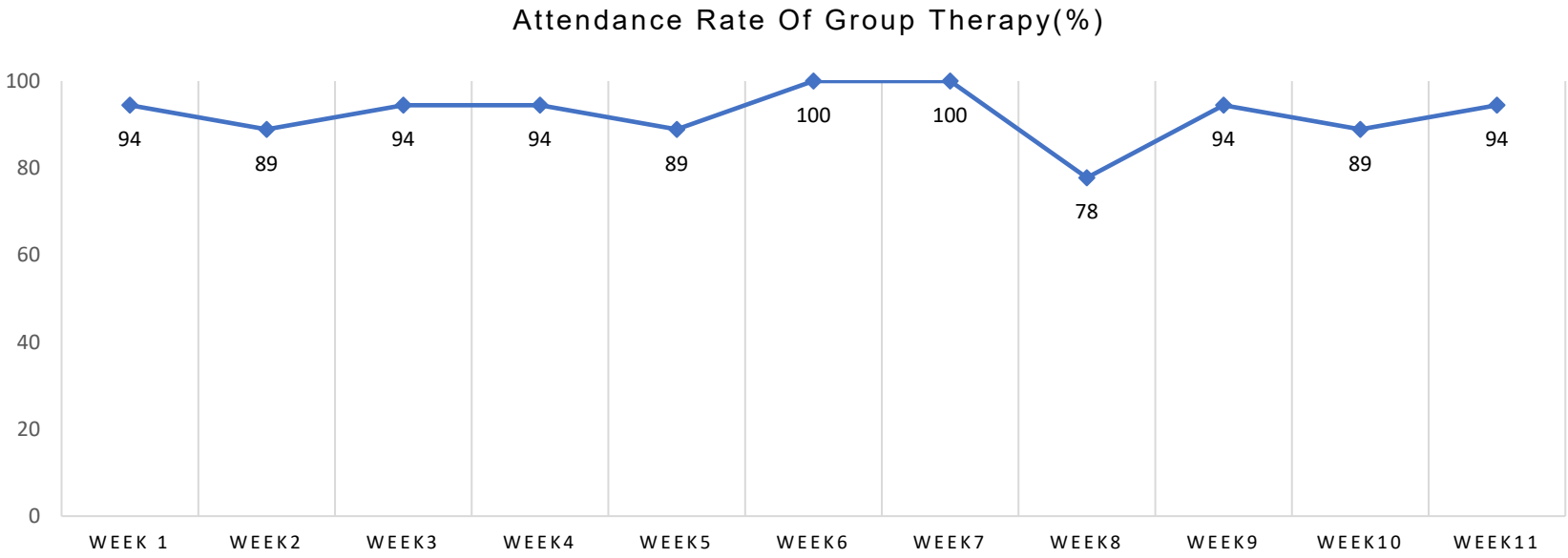

Figure 2.5 The Attendance Rate for the Weekly Group Therapy in the Treatment Group

Chapter 3 Assessing the Satisfaction and Acceptability of a Group-based Parent Coaching Intervention: A Mixed-Methods Approach

3.1 Introduction

Early Intensive Behavioral Intervention (EIBI) is a common treatment based on applied behavior analysis principles for young children with autism spectrum disorder (ASD) (Center, 2009, 2015; Eldevik et al., 2009; Weisz & Kazdin, 2010). EIBI typically lasts two years of training in a one-to-one adult-to-child setting for 20-40 hours per week (Eldevik et al., 2009), resulting in significant gains in IQ and/or adaptive behavior (Reichow et al., 2018). Despite the potential long-term contribution to lowering special education (Chasson et al., 2007) or lifetime care costs (Piccininni et al., 2017), EIBI has a high demand for trained specialists, and the cost of EIBI services for each family remains high, ranging between $33,000 and $50,000 per year (Jacobson et al., 1998). Systematic barriers, such as a shortage of trained professionals (Liao et al., 2021), disjointed care coordination (Vohra et al., 2014), and high service cost (Sobotka et al., 2016; Vohra et al., 2014), result in insufficient access to EIBI. To help overcome these barriers, the involvement of parents in implementing intervention strategies allows intervention to begin early and sustain (Green et al., 2015; Green et al., 2017).

Parent-mediated Intervention (PMI) is an effective evidence-based practice (EBP) which was identified by the National Professional Development Center on Autism Spectrum Disorder (NPDC) (Wong et al., 2015). PMI focuses on teaching parents how to promote social interaction, communication, imitation, and play skills for their children with autism (K. Bearss et al., 2015; Oono et al., 2013). Systematic reviews suggested the benefit of parent-mediated interventions in

children with autism included motivation to interact, joint attention, imitation, nonverbal and verbal communication (Estes et al., 2014; Jurek et al., 2021; Nevill et al., 2018; Oono et al., 2013). PMIs have been widely adopted for very young children with autism, such as JASPER (Kasari et al., 2006; Kasari et al., 2010), Project ImPACT (Ingersoll & Wainer, 2013; Stadnick et al., 2015), Parent-mediated Early Start Denver Model (P-ESDM) (S. Rogers et al., 2012; Vismara et al., 2013). PMIs have shown promising effectiveness (Deb et al., 2020) in home settings (Poslawsky et al., 2015; Siller et al., 2013), clinical settings (Green et al., 2010), community settings (Eapen et al., 2013; Edwards et al., 2019; Stadnick et al., 2015), and school settings (Goods et al., 2013). Liu et al. (2020) systematically reviewed 21 parent-mediated interventions in China, most of included studies were conducted in clinical settings or in a university. However, over half (14/21) of the included studies failed the quality evaluation. Liu et al. (2020) concluded that the identified programs lacked the capacity to be further disseminated in Chinese societies due to a lack of underlying theoretical frameworks, under-reported implementation outcomes, and the insufficiency of cultural adaptations.

Families of a child with autismin China face two key challenges: limited access to appropriate health services and a shortage of trained professionals. Access to parent training services is restricted in mainland China due to health insurance coverage, parents' time limits, and geographical barriers (Hu, 2019). In China, 0.70-1.00% of the population is diagnosed with autism (Sun, Allison, Matthews, et al., 2013; Sun et al., 2019; Zhou et al., 2020). According to the Seventh National Population Census in China (Ning, 2021), there were 253.38 million children under 14 years of age, this translates to about 1.75-2.53 million children with autism who need access to pediatricians and rehabilitation-related therapists. However, the number of pediatricians and rehabilitation-related therapists in China was only about 100,000 and 30,000

respectively in 2005 (Wu et al., 2015). There was and continues to be a scarcity of professionals who can provide evidence-based treatments (Hu & Yang, 2013; McCabe, 2012). The shortage of trained specialists in mainland China hampered the delivery of early intervention services, resulting in a long waitlist for enrollment and high-priced programs (Chang & Zaroff, 2017; B. Zhou et al., 2018). The scarcity of early intervention services in China reflects a massive imbalance between the number of professionals qualified to provide EBP treatments and patients in need. Such conditions call for research on innovative service models and delivery formats to address issues mentioned above.

The Early Start Denver Model (ESDM) is an evidence-based practice designed for young children with autism aged 1 to 5. It adopted behavioral and developmental principles to promote overall development and autism-related outcomes (Rogers & Dawson, 2010). The parent-mediated ESDM (P-ESDM), developed by S. Rogers et al. (2012), focused on the quality of social interaction between children with autism and their caregivers, as well as a framework to embed specific objectives across all developmental domains. P-ESDM has the potential to be delivered successfully through telehealth methods. Vismara et al. (2012) examined the telehealth delivery of P-ESDM and suggested that parents were successful in learning similar content via telehealth. The remote coaching allowed parents to use strategies more often in their daily interactions with children. There were two research studies examining the effectiveness of P-ESDM on preschoolers with autism in mainland China. Xu et al. (2017) examined the efficacy of an 8-week ESDM plus other eclectic intervention services delivered by teachers. B. Zhou et al. (2018) conducted a non-randomized trial to compare a 26-week, high-intensity, P-ESDM intervention with a general community-based treatment program. Both studies were conducted in a clinical in-person setting and showed positive results in participating children. However, those

two studies did not provide information on the program implementation or from parents' perspectives. The evaluation of program implementation, such as acceptability, appropriateness, and feasibility, is critical when translating existing EBPs into a different cultural context (Karsh, 2004; Proctor et al., 2011). There is a gap in the literature to conduct pilot evaluations on the parental acceptability, cultural appropriateness, and treatment feasibility in the Chinese context.

Telehealth could be a potential service delivery solution to address limited access for families in China. Telehealth is defined as a provision of health care remotely through the usage of a variety of telecommunication tools, such as telephones, smartphones, and mobile wireless devices, with or without a video connection (Dorsey & Topol, 2016). The application of telehealth in providing education sessions has been widely adopted when delivering parent-mediated intervention to parents of young children with autism. Parsons et al. (2017) systematically reviewed parent training programs which were delivered remotely for children with autism living outside urban areas. Preliminary evidence suggested that remotely delivered parent-mediated intervention training may improve caregiver expertise, enhance intervention fidelity, and improve social and communication skills in children with autism. Among those seven studies included in the systematic review, there were only 2 randomized controlled trials (Ingersoll & Berger, 2015; Ingersoll et al., 2016). Pickard et al. (2016) suggested that the telehealth could be an efficient delivery model for evidence-based parent training interventions.

Group-based parent training may help to offset the shortage of professionals in China who specialize in autism-related services. O'Donovan et al. (2019) conducted a systematic review to examine group-based parent training interventions for families of children with autism. According to their findings, group-based parent training interventions improved parent behavior, children's behavior, parent health, and social support. However, with 12 out of 13 included

studies falling below the quality rating threshold, O'Donovan et al. (2019) stated that those findings should to be interpreted with caution and be further investigated using better study design and methodology. Banbury et al. (2018) found that health professional-led group videoconferencing was a feasible option for that to provide education and social support into the home setting. Group-based interventions via videoconferencing enhanced accessibility, and the effects of the videoconferencing groups were comparable to those of in-person groups (Banbury et al., 2018).

During the recent COVID-19 pandemic, there was a trend in the use of telehealth to deliver services for young children with autism and their families, such as social communication interventions (Simacek et al., 2021), diagnostic assessments (Gibbs et al., 2021), early interventions (Mullan et al., 2021; Pickard et al., 2016), and ABA related services (Ferguson et al., 2019). Therefore, we developed a culturally adapted group-based parent coaching intervention based on the P-ESDM. It was delivered through telehealth to support families with a newly diagnosed child in mainland China. The intervention aimed to educate parents on evidence-based techniques that they could use in everyday activities to stimulate their child's progress while waiting for more intensive services. A randomized controlled feasibility trial of this program was conducted to explore the feasibility and effectiveness of the program. The treatment group (web + group therapy) navigated the same website as the active comparison group (self-directed) with an additional 1.5 hours of group coaching therapy weekly.

The primary focus of the present study was not whether the program was effective, but rather, how the end-users, parents, evaluated the program in terms of satisfaction and acceptability. We adopted a mixed methods approach in the program evaluation because it enabled researchers to engage different stakeholders, such as providers and parents, to evaluate

the program implementation (Nastasi et al., 2007). This mixed methods study followed "the conceptual framework for implementation outcomes" (Proctor et al., 2011) to evaluate the implementation effectiveness. Acceptability, appropriateness, and feasibility were constructs which measured the implementation from the patients' level. Moreover, acceptability, appropriateness, and feasibility were considered as "leading indicators" of implementation success (Weiner et al., 2017). The evaluation of implementation success could facilitate researchers to distinguish if the failure occurred in the implementation process or the intervention was ineffective in the new setting. Therefore, it is essential to test the feasibility and acceptability of the end-users about the program when implementing EBPs in a new context. Furthermore, the perspectives of the end-user may facilitate a better understanding about the experience of these families and inform future development, adoption, and implementation of EBPs in a new population.

Overall, the present study used a concurrent convergent mixed-methods design to evaluate Chinese parents' perceptions regarding their participation in a 12-week culturally adapted group-based parent coaching intervention via telehealth. The intervention implementation was evaluated quantitatively using a program evaluation survey and qualitatively with focus group interviews conducted immediately after the intervention. The intervention implementation was assessed in parents' satisfaction, acceptability, appropriateness, and feasibility.

The quantitative objective was to determine if the two telehealth conditions evaluated the program implementation differently. The qualitative objective was to obtain the nuance understanding about parents' perceptions about their 12-week experience in this telehealth intervention. The mixed-methods objective was to merge the qualitative and quantitative findings

and generate integrated findings to obtain a more comprehensive evaluation on the implementation of this culturally adapted telehealth intervention from Chinese parents' perspectives.

3.2 Methods

3.2.1 Study Design and Ethical Approval

The current study used a concurrent convergent mixed-method design. The data resource were the program evaluation survey and five focus group interviews at post-intervention in a group-based parent coaching intervention via telehealth in China. The design diagram for the study design is presented in Table 3.1. To obtain a comprehensive understanding from the parent perspective, the mixed methods integration strategies included matching (Fetters et al., 2013) survey questions to focus group prompts and merging (Fetters et al., 2013) the qualitative and quantitative findings through a side-by-side joint display (Guetterman et al., 2015) with meta-inferences and an assessment of fit. Ethical approval was granted by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00182526).

3.2.2 Participants

Thirty-two parents who completed the post-intervention program evaluation survey in the intervention study were included in current study. The inclusion criteria for participating the intervention study were: (1) parents over age of 18, (2) with a child aged 2-5 years old with a diagnosis or a strongly suspected diagnosis of ASD made by a psychiatrist within 6 months, (3) with access to the Internet and a digital device to receive the web-based intervention, and (4) the participating child met or exceeded cutoff scores of 10 (social interaction), 8 (communication and language), and 3 (restricted and repetitive patterns of behavior or interest) on the Autism

Diagnostic Interview-Revised (ADI-R) (Lord et al., 1994). Participants were recruited online through parent groups and community service providers.

There were 18 participants in the group-based treatment group (web + group therapy) and 14 participants in the active comparison group (self-directed). Parents were randomly assigned to the treatment or comparison group. All participants received informed consent prior to participation in the intervention study and focus group, 24 of 32 agreed to participate in the focus group. Not all participants completed all the modules at post-intervention assessment; the intervention completion ratio was calculated by dividing the number of participants who completed the 12-week intervention by the total number of participants in the group. Table 3.2 displays the participants' demographic characteristics.

3.2.3 Intervention

The Group-based Parent Coaching Intervention is a culturally adapted program that uses the Parent-mediated Early Start Denver Model (P-ESDM) as the structure(Vismara et al., 2009; Vismara et al., 2013; Vismara et al., 2012). The 12-week program was delivered in Chinese via the Canvas online learning management system, and each module covered one of the following topics: (1) Autism and what to expect, (2) Increasing the child's attention, (3) Sensory social routines, (4) Dyadic engagement, (5) Nonverbal communication, (6) Imitation, (7) ABC's of learning, (8) Joint attention, (9) Play, (10) Pretend play, (11) Speech development, and (12) Program summary. To fit the knowledge level and demands of Chinese parents, the program was modified using a family-capacity-building approach with four types of intervention materials. They were: (1) asynchronous lectures, (2) module-specific practice manuals, (3) demonstration videos, and (4) commentary videos. The Lectures were asynchronous videos that emphasized the understanding and application of intervention strategies for young children with autism. Each

module included a practice manual with instructions and reflection questions to help parents practice on their own at home. The Demonstration videos were authentic video vignettes of parents interacting with their children while implementing intervention strategies, while the Commentary videos highlighted the timing and key characteristics of the practices. Activities in the Demonstration videos were culturally appropriate and had a Chinese subtitle. In addition, parents were encouraged to discuss and share their experiences in a Q&A session on the Canvas website. Parents voluntarily submitted homework each week, and those who did received individual feedback from the therapist.

During the intervention, the active comparison group (self-directed) navigated the program on their own pace, whereas the treatment group (web + group therapy) followed the same program but also participated an additional 1.5-hour virtual group therapy session every week. The weekly group therapy was a synchronous group-based parent coaching session via telehealth. Each session lasted 1.5 hours and followed a standardized protocol to guide reflection via a videoconferencing software, DingTalk. The program was designed under the supervision of a senior licensed ESDM trainer who is also a clinical psychiatrist and delivered by a licensed physical therapist who is a native Chinese and has completed ESDM Introduction and Advanced trainings.

3.2.4 Measures

3.2.4.1 *Demographics*

Basic demographic information was reported by parents including age, sex, education level, employment status, family income and structure, as well as the age and gender of their children with autism.

3.2.4.2 *Quantitative Evaluation: Program Evaluation Survey*

The post-intervention Program Evaluation Survey (Appendix E) was developed by the authors to evaluate (1) parents' perceptions of the program implementation, and (2) perceived competence and self-efficacy. The first 12 items (item1-12) focused on the program implementation, while the remaining 20 items (item 13- 32) focused on parents' perceived competence and self-efficacy in each week's skills. The survey used a 5-point Likert scale, with responses ranging from 5 (very agree) to 1 (very disagree). Item 1-12 evaluated the program in the following aspects: satisfaction, recommendation, acceptability, appropriateness, feasibility, program difficulty, background knowledge, and frequency of use. Acceptability, appropriateness, and feasibility items were extracted and modified from the published measures with strong psychometric properties, the Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) (Weiner et al., 2017). Satisfaction, acceptability, appropriateness, and feasibility had two items each, assessing both the program content and telehealth delivery. In addition to those four constructs, we asked participants to rate the difficulty level of the program, the need for background knowledge, the frequency of use, and their recommendation for improving future iterations of the program. Item 13-32 asked parents about their perceived competence and self-efficacy in relation to the skills of the week. Total perceived competence and total self-efficacy were calculated by adding the scores from each week, with a maximal of 50 (see Appendix E for original survey questions). According to the results of the Cronbach's alpha analysis, the Program Evaluation Survey indicated excellent internal reliability ($\alpha = 0.95$) for the total scale. Specifically, the Cronbach's alpha for the implementation questions (item 1-12) was good, $\alpha = 0.84$, and excellent ($\alpha = 0.96$)

for questions on the perceived competence and self-efficacy (item 13-32). All items on the scale appeared to be worthy of retention, resulting in a decrease in alpha if deleted.

3.2.4.3 *Qualitative Evaluation: Focus Groups Interviews*

The purpose of the focus group interviews was to learn about parents' perceptions toward this parent coaching intervention based on their 12-week telehealth experience. The focus group allowed researchers to explore the "what" and "why" questions corresponding to the survey questions. It aimed to foster insights about personal perceptions, technical and social issues and practical experience that parents encountered during the intervention. The focus group followed a semi-structured interview with 15 prompts based on the same conceptual constructs in the Program Evaluation Survey. Table 3.3 shows the examples of matching survey questions to focus group prompts. For example, the first question in the focus group was matched with the construct of satisfaction and the fifteenth question was matched with recommendation. Matching was a type of integration procedure in mixed methods research during data collection, where the researcher intended to collect both qualitative and quantitative data about the same domains, constructs or ideas (Fetters, 2019).

Twenty-four of the 32 participants in the intervention study took part in the focus group interviews. The 24 participants were divided into 5 groups based on their conditions and availability. In the end, two focus groups were held for seven participants in the self-directed condition (comparison), and three focus groups were held for seventeen participants in the group therapy condition (treatment). Five focus groups were conducted in Chinese, immediately after the intervention, via videoconferencing software DingTalk. Each focus group lasted about 1 to 1.5 hours, was audio-recorded, and included 2 to 6 parents. A trained qualitative researcher who was not affiliated to the study facilitated all five focus groups as a moderator, the same agenda

was followed to ensure that all questions were addressed. All the five focus interviews were audio recorded. The specific prompts are listed in Table 3.3.

3.2.5 Data Analysis

Quantitative statistical analyses were conducted using SPSS 28.0. *P*-values below 0.05 were considered statistically significant. Program Evaluation Survey data was exported from Qualtrics to run descriptive statistics. All data were reviewed for independence, normality, and homogeneity of variance. Descriptive statistics including frequency, mean, percentages and standard deviation were computed. Independent-samples t-tests were conducted to compare parents' evaluation on the program implementation, perceived competence, and self-efficacy between treatment and comparison groups.

The qualitative data from focus group interviews were de-identified and transcribed verbatim in Chinese. Thematic analysis was conducted with the overarching research goal of understanding parents' perspectives based on their 12-week experiences in this telehealth intervention. Those experiences included, but were not limited to, their personal perception of the program, perceived fit of the program in terms of whether it addressed a specific issue or problem, and the extent to which the skills learned can be successfully implemented. We followed the procedures for the thematic analysis approach described by Braun and Clarke (2006), which uses the constant comparative method focusing on abstraction rather than description of data. All the transcripts were read and re-read by the author and a qualitative researcher to gain familiarity, and initial thoughts were noted separately. The initial codes were generated independently by the two researchers based on the construct/scope of questions asked in the focus group, discrepancies were addressed through discussion. The preliminary codes were then collated into each potential theme in a systematic manner using a constant comparative

method. Six rounds of review sessions were conducted to ensure the data extracts illustrated the analytic themes and identified the subthemes within each theme. Then, two researchers reviewed the themes and subthemes against the original transcripts to reexamine and determine the analysis summarized a convincing and well-organized story about the data and topic. The most relevant quotes were highlighted and extracted from the transcripts, and the quotes were translated in English and reviewed independently by the authors. Lastly, themes, subthemes, and codes were translated into English and reviewed with an English native speaker who is a pediatric physical therapist to ensure accuracy.

3.3 Results

3.3.1 Participant Characteristics

As shown in Table 3.2, most parent participants who completed program evaluation survey were mothers (27/32, 84%) with a college degree or higher (20/32, 62%), and 47% of mothers (15/32) was unemployed. 84% of families (27/32) lived in urban area, and 72% (23/32) had a three-generation family structure. 78% of families (25/32) reported with a monthly family income of less than $3000. Most of the child participants were male (27/32, 84%) and not born preterm (28/32, 88%). The average age of child participants was around 3.2 years old, and 66% of them were nonverbal (21/32) at enrollment.

3.3.2 Program Evaluation Survey

Thirty-two parents in the intervention study completed the Program Evaluation Survey. Table 3.4 displayed the descriptive statistics of Skewness and Kurtosis. The scores of *Recommendation* in the self-directed condition was non-normally distributed, with skewness of -1.89 and kurtosis of 4.67. The other items in the survey were fairly symmetrical because the

absolute values of Skewness and Kurtosis were less than 0.5 or less than 3 times the standard error. The homogeneity of variance was tested through Levene's test, and no significant results were obtained, assuming no violence in homogeneity of variance.

Table 3.5 showed the average scores on implementation questions (item 1-12) as well as total scores on perceived competence (item 13-22) and self-efficacy (item 23-32) by groups. The independent-samples t-tests were conducted to examine the group differences. There were no group differences on item 1 to 12 regarding parents' ratings on the program content or telehealth delivery on satisfaction, recommendation, acceptability, appropriateness, and feasibility. According to the findings, both groups held similar perceptions on program implementation. Specifically, Figure 3.1 showed the percentage of ratings on item 1 to item 9 in program evaluation survey. Except for item 7, almost all parents rated positively for the majority items. There were 11 out of 32 (34%) parents rated neutral and 1 parent (3%) rated negative on Item 7, the Appropriateness of Telehealth Delivery. Figure 3.2 showed the percentage of ratings on item 10 to item 12. The program's difficulty level was rated moderate by 47% of participants (15/32) with 16% rating it easy and 6% rating it very easy. 50% of participants (16/32) rated "somewhat needed" on the background knowledge, 25% (8/32) rated "little needed", and 13% (4/32) rated "much needed". The majority of participants (17/32, 57%) used the program 2-4 times per week, with 34% (10/32) studying less than two times per week.

Parents in the self-directed condition (M= 30.14, SD = 14.78) had significantly lower scores in *Total Perceived Competence* than parents in the web + group therapy condition (M=38.72, SD=8.14), t (30) = -2.09, p <0.05, and the effect size was median, Cohen's d = -.75. The negative effect size indicates that the mean in the second group was larger, and the negative effect size indicates that the effect increased the mean when adding treatment. The results

showed that there existed a significant difference in parents' perceived competence between the treatment and the active comparison groups. A median effect size indicated that there may be a moderate treatment effect on perceived competence between groups. However, there was no group difference on the total scores of self-efficacy, t (30) = -1.44, p = 0.16.

3.3.3 Focus Group Interviews

Qualitative results including themes, subthemes, and codes (with original Chinese results) were summarized in Table 3.6. Five overarching themes emerged, most of which reflected constructs in the conceptual framework for implementation outcomes and included suggestions for future research.

3.3.3.1 ***Theme 1: Acceptability***

During the focus groups, parents talked about their personal experience with various dimensions of this web-based program, five subthemes emerged within this major theme: 1) content, 2) design, 3) delivery, 4) participation, and 5) group therapy†[1].

Content

Parents across both intervention groups had overall positive perception on the program content, and they particularly commented on the program being professional and systematic with substantial learning materials. 2029 stated, *"The knowledge covered in the program is systematic and the topics are very comprehensive."* In addition, parents mentioned that the materials covered in the program focused on the key points and was digestible. 2029 added, *"The whole program was presented in a very clear way to me. There are many techniques to use and steps to follow. These were clearly explained and emphasized."* Furthermore, parents identified their

[1] †: subthemes emerged from responses within parents in the treatment group (Web + group therapy)

favorite and most challenging techniques for interacting with their children. The most frequently mentioned techniques were presented in Table 8. For example, one parent (1002) stated that the use of gesture worked best in their situation, she stated, *"I found his communication becomes much better after using gestures and his emotional problems get better as well, and I believe that the use of gestures opens a door for him in communication."* Another parent (2021) mentioned joint attention was her favorite topic, *"It allows me to build a connection between me, my kid, and an object, and this connection is like magic that makes the interaction between me and my child more natural in a harmonious way."* However, 3135 found joint attention techniques quite challenging, *"If I initiate the joint activities, now he can respond and follow. However, it is challenging for him to initiate and share first. We are still working on that."*

Design

When asked about the program's design or structure, parents stated that it was well structured and easy to follow, and that the design was innovative, with an acceptable weekly dosage. 1005 stated, *"I really liked the way the instructor breaks down each module into steps, which are very easy to follow. In addition, the duration for learning is about 30 minutes, which can be finish quickly."* In addition, parents endorsed the topic sequencing in a learning progression and the structure encouraging participation and self-learning. 1002 stated, *"There are setups in the program which really motivate me to learn, such as the new module unlocks when you finished the prerequisite in previous week."* The tailored feedback, demonstration and commentary videos, and group discussion were the top three learning components that parents stated as their favorite. For example, 1019 stated, *"The teacher explains why we should do it and how to do it in the commentary videos. She uses no terms and presents the theoretical part in a digestible, easy-to-understand way."*

Delivery

Parents shared their personal perceptions and experience on the program delivery when discussing about the telehealth format of this web-based program. They stated that telehealth delivery increased access to services and professionals, was time-efficient, and provided an alternative method without location or space constraints, particularly during the pandemic. 1002 stated, *"Remote learning is more convenient and timesaving, especially after COVID. It is flexible for parents to arrange time for learning and for practice with the kids."* The limitations of remote learning were the high demands on the Internet and the reliance on technology. 1018 stated, *"There's only one computer in the household which is my husband's. Therefore, I have to study when he is not working."* Most parents experienced slow downloading speeds when viewing learning materials, and other incidents for smartphone and tablet users included Canvas app crash and video stuck in processing. For example, 2043 mentioned, *"I was really frustrated with the Internet speed; it took forever to download the videos. Then I went to upgrade my broadband and problem solved."*

Participation

Parents felt empowered and strengthened when they realized they could integrate techniques learned each week into their children's daily activities. It did, however, take some time for parents to implement the techniques with their children, and some reported that the rate of progression differed between themselves and their children. For example, 3233 mentioned, *"… the kid does not always respond like a textbook or respond as you expected. I need to repeat the skills in the previous week so that I can use newly introduced strategies to interact with him."* Parents encountered numerous situations when submitting homework, the most commonly described ones were children unwilling to participate, target behaviors hard to capture, and

failure practice not being reviewed. For instance, 2036 stated, *"There are times that I cannot record the video as I planned. Sometimes it's because I cannot proficiently use the skills, sometimes it's the child not being cooperative."* However, majority of parents stated that homework assignments helped them reflect on the skills and techniques learned in the program, and that tailored feedback was useful and help guide learning. For example, 1002 stated*, "The feedback is very informative, and I benefit a lot from that." 1019 stated, "I can go back and watched it (homework) with the comments from the teacher...And this is the biggest takeaway from the program."* The main reason for not submitting homework videos was a lack of family support. For example, 1018 stated, *"It's very difficult for me to submit the video homework because I am the only parent in the household."*

Group therapy[†]

This subtheme was generated based on prompts solely for parents in the treatment group (17 out of 24). They indicated the group therapy sessions relieved stress and created an interactive learning environment where they received direct coaching from the therapist and interacted with peers. For example, 3131 stated, *"We have a scheduled time spot every week...I believe this is a core strength that online group session holds compared to the one-to-one therapy because it helps every family in the group to relieve their parenting stress at different levels."* 2036 stated, *"The feedback that I got from group discussion session was splendid."* Many parents stated that they felt committed to participating in the group session, with guided reflection, peer commenting, and role-playing receiving the most votes as their favorite group activities. For example, 3230 stated, *"I know things that I need to accomplish within the week, which gave me lots of motivation. The group session is great for me and keeps me in tune and updated."* 2021 mentioned, *"The teacher made a live demonstration, and then each parent*

played a role and practiced the skills online. I was really overwhelmed because I did not know the virtual group can be interactive and highly engaged."

3.3.3.2 *Theme 2: Appropriateness*

A second theme that emerged was the perceived fit of the web-based program to address a specific problem or to achieve a specific purpose. Five subthemes emerged: 1) family-centered care, 2) home-based intervention, 3) strategies relative to daily activities, 4) remote learning platform, and 5) program-based community†.

Family-centered care

According to the parents, this web-based program provided an opportunity for all family members in the household to participate. For example, 3131 stated, *"My biggest takeaway is the environment that we built as a family and its impact on the child, because we REALLY are seeing his progress every week."* Many parents commented that the intervention skills and techniques emphasized parent-child interaction and the program emphasized parent mental health. For example, 1014 stated, *"My arms had a lot bruises that his bites as he attacked a lot, I was very anxious back then. But now, we are very close and intimate, our relationship is influenced the most."* Meanwhile, parents reported that their interaction with their children after work was limited. As 2026 mentioned, *"We have two kids … Sometimes the kid could already be asleep by the time I get home. It is challenging."*

Home-based intervention

Parents stated that this web-based program was a good fit since materials or skills provided could be used at home, and the self-directed program was flexible without time or location limits. Many parents indicated the remote learning was advantageous since it saved time

and money that would have been spent on travel. For example, 3227stated, *"The remote learning is time-saving. We don't have to take the kid to the institution... it is really convenient."* Furthermore, parents stated that they had never considered home as a possible intervention site, and their attitude toward early intervention shifted from a heavy reliance on local resources to a more balanced partnership between family and professionals. For example, 3233 stated, *"I used to believe placing the kid in an institution that works 24 hours a day was the best solution, but I don't have the financial ability to do so. I now realize I can interact with my kid with skills, and he trusts me more."* However, several parents experienced interruptions during intervention, such as business trips, being sick or other life responsibilities. For example, 1018 stated, *"I take care of my child all by myself. I had a fever once and had trouble concentrating on any task."*

Strategies relative to daily activities

Parents viewed this web-based program suitable because they learned intervention skills through the life events, and these intervention strategies could be integrated into their child's daily routine to intervene. For example, 2029 stated, *"All the skills enable me to have a better understanding of my child. I often use steps and skills to plan out our daily activities now."* Many parents mentioned the child-led mindset was fitting to promote the parent-child relationship. It also aided in better understanding the motivation behind the child's behaviors. For example, 1019 stated, *"The ESDM is more like a mindset to me. It has a good concept, to follow the child's lead. You should start with his interests and incorporate that into his daily routines and games."*

Remote learning platform

The web-based program used Canvas to distribute learning materials. Parents valued this program because it supplemented the limited local resources and allowed them to access the

materials repeatedly as needed. For example, 3135 stated, *"I can arrange time to study the learning materials because we can watch these videos repetitively."* 3233 stated: *"I think remote learning is extremely awesome because we can get in touch with American experts."* However, most parents had negative experiences with the Canvas app or video streaming to varying degrees, and many complained that remote learning lacked in-person interaction and could not provide instant feedback. As 3227 mentioned, *"The only thing that I am not satisfied with is the difficulty of using the APP... The DingTalk meetings sometimes get very laggy...but it is common for remote learning."* 1020 also mentioned that the communication was not timely, she stated, *"I gave some feedback on the software problem at the beginning of the program and I had to wait for the next day to get a response. The problem could not be solved in time due to the time difference."*

Program-based community†

Parents, in the treatment group, viewed the online group therapy as efficacious for creating a program-based community where they provided social-emotional support, shared personal experiences, and reduced stress and anxiety. For example, 2029 stated, *"After discussing with other parents, I find comfort in the fact that everyone is in the same situation, and that means I am not bad at taking care of my child."* 3233 mentioned, *"I feel less anxious when I get to know other moms with older kids. I feel it is ok that my kid doesn't have some skills now, I believe he will gradually get it, just like other kids."*

3.3.3.3 *Theme 3: Feasibility*

Parents discussed the components that enabled them successfully to implement the intervention skills with their child. Five subthemes emerged: 1) parent modelling, 2) step by step instruction, 3) learning by doing, 4) formative and tailored feedback, and 5) peer learning†.

Parent Modelling

Many parents stated the demonstration and commentary videos facilitated them to carry out the intervention skills at home. Especially through parent modelling, they found it doable and intuitive to observe and learn. For example, 1019 stated, *"I will not know how to practice the strategies out if I only watched the lecture videos. The combination of lectures and demonstration videos makes the intervention a relatively easy and doable task."* 3227 also mentioned, *"You can observe directly what techniques other parents use in demonstration videos."*

Step by Step Instruction

One of the practical reasons for the success of the intervention strategies was the step by step instructions. It guided parents to interact with their child and perform the intervention strategies. For example, 3135 stated, *"There was a practice manual for each module, it tells us what to do at each step."*

Learning by Doing

Many parents indicated this web-based program emphasized the application of intervention skills and strategies through daily routine activities or play. For example, 1002 mentioned, *"This program focuses more on social interaction strategies which can be used in parent-child interaction at home."* They expressed that skills learned in the program was easy to apply and implement as most situations occurred in a naturalistic setting. 2029 stated, *"Without the demonstration videos, I would never know there are strategies which can be used when putting on shoes, putting on clothes, even when eating meals together."*

Formative and Tailored Feedback

Tailored feedback was one of the program components that most parents praised. Parents stated that the feedback facilitated them to complete the program and implement the strategies in a relatively easy way. For example, 3226 stated, *"After reading the feedback, I know where I did well and why it worked, also what I lacked, I will try to improve that for next time."* They also indicated that the tailored feedback provided them with relevant information or cues to guide them towards a possible solution given their existing personal resources and circumstances, rather than just a simple judgement of whether their performance was correct or not. A few mentioned the feedback was delayed due to the nature of the program structure. 3228 stated: *"My practice feels different given the feedback I got. It made me understand my child's behavior and reflect on my own behaviors."*

***Peer Learning*†**

Peer learning experience was another subtheme emerged from responses within parents in the treatment group. They valued the group session because it allowed them to share ideas and learn through group discussion and group activities. For example, 3135 stated, *"At the reflection section, the parents comment on each other's homework, which is a great learning activity. We are able to learn from others' strengths."*

3.3.3.4 *Theme 4: Project-level Suggestions*

During the focus groups, we asked about how the program could be improved to encourage participation, and parents responded with suggestions based on their own experiences and needs. Three subthemes emerged: 1) personalized pace, 2) advanced program in need, and 3) group-shared platform for maintenance.

Personalized Design

Although parents navigated the program at their own pace, many expressed their preferred progression. Some wished that the first few weeks be extended so that they could practice more, while others wished that the content in the latter weeks be given more time. For example, 1002 stated, *"...could we extend the module? For example, we could have divided one week into two and studied more thoroughly."* 3131 suggested, *"The instructor could gradually step back from a central role. In this case, we, parents, not only learn theoretical concepts, but master these techniques in a real-world setting."* Some parents suggested having case study opportunities to address a specific problem they encountered in their lives, such as bedtime routines, mealtimes, and challenging behaviors. 3233 stated, *"How about the group session solely focused on one family, we could discuss everything about the child, such as his functioning level, what he can and cannot do, and then propose intervention strategies for the mother?"* Parents in the treatment group proposed a grouping strategy based on children's levels of functioning, so that the session's topic could be packed together. Some parents also suggested a live stream coaching session in which parents and children interact in front of the camera and receive feedback. 2036 stated, *"Perhaps the courses could be assigned to parents based on their child's level of functioning."*

Advanced Program in Need

The advanced program was in high demand among the parents, particularly those in the treatment group. Several parents inquired about a motor or language-specific program, while others suggested that more information on adaptive skills in the future. As 2023 stated, *"My child's receptive and expressive language skills have greatly improved, but there's still room for improvement in daily living skills. I wish there was more content focusing on that."* Parents

expressed their needs for an in-person program and group therapy for their children. For example, 3131 stated, *"We would also like to see an improved in-person version of this remote-learning program. If possible, I believe our family would benefit greatly from this."*

Group-shared Platform for Maintenance

In addition to extending access, parents in the treatment group suggested establishing a shared platform for practice videos or their own toy collection. 3124 stated, *"I wish there was a way for us to share with individual accounts so that we could watch each other's videos."* Parents suggested that the program groups be kept for follow-up and additional group therapy sessions be held. 3227 stated, *"I wish we could keep talking for another two or three months after the program is over. stay in touch with the instructor and each other."*

3.3.3.5 *Theme 5: Service-level Considerations*

Parents highlighted their success and accomplishments in the focus groups, and the discussion expanded beyond project implementation, from an individual to a service level. Three subthemes that most connected to service outcomes emerged: 1) cost, 2) timeliness, and 3) perceived effectiveness.

Cost

Even though the current study was funded, parents expressed a willingness to pay for telehealth services, particularly high-quality services. 1019 stated, *"I am willing to pay. Nowadays we all know that you must pay for knowledge. It's worthwhile if the expertise and service are decent."* Some parents reported that they could detect the difference between high- and low-quality services after the intervention, and the cost for equivalent services relied on the therapist-to-patient ratio and the therapist's qualification. 3233 stated, *"When it came to the cost,*

I always evaluate if the treatment session is one-on-one or one on many. Our group has a one to six ratio, which is acceptable."

Timeliness

Another subtheme emerged on the service level is the timeliness. Most parents would recommend such a program to newly diagnosed families, and to families with young children aged 2-5. 1002 stated, *"If I had the chance, I would've enrolled my child in the program when he was younger, and I would strongly recommend it to younger kids. I feel like time is more valuable when we integrate strategies in the play to promote his development."* Parents noted the remote learning could assist underprivileged families receive timely treatment, and they recognized the potential of adopting ESDM in the neural typical family as well. 2023 stated, *"Many clinicians, including therapists, in the second-tier city here at southwest China are unfamiliar with ESDM ... I also met speech therapists who do not heard of ESDM. This online program gave me access."* 2043 added, *"I believe that most families, including NT families, require such a program because parents are too busy working to educate and raise their children."*

Perceived Effectiveness

Parents shared their perceived changes during the focus groups, and they indicated how much they learned about autism and how their attitude towards autism intervention changed. 3228 stated, *"I did not know anything about ASD. I started to learn about Autism while watching other kids' behaviors in the demonstration videos."* 1002 stated, *"I feel that once I began to use the program's strategies or skills, parenting became easier for me."* Parents also highlighted individual changes, such as changes in child behavior, parenting skills and parent-child interaction. For example, 1018 stated, *"I learned how to interact or play with my child in a*

natural living environment, how to follow him and set up the joint activity… I feel he progressed tremendously." 2021 stated, *"I love my kid more because I discovered something subtle in her behaviors which I missed before. I understand her better now."* 2023 stated, *"My child improved greatly over the past 3 months. He could only say "hua" and "shi" on September 7th, but now he can speak sentence, count numbers, even recite poetry. Great improvement."* Parents also mentioned parental self-efficacy and mental health improvement. 3131 stated, *"Now I can see his progress from the beginning, and I can identify how he improves and appreciate his progress. It is the parenting mindset that changed most."*

3.3.4 Mixed Methods Findings

The mixed methods findings occurred by merging the quantitative and qualitative results. A more complete understanding of the research question was achieved by relating the conceptualized themes and subthemes to interpret and develop inferences between the quantitative and qualitative findings. The joint display provided descriptive statistics of the program evaluation with the qualitative themes and subthemes from the focus group, and the meta-inferences are reported accordingly in Table 3.7.

Overall, the two types of findings related to each other with regards to the majority of implementation outcomes, such as acceptability, appropriateness, and feasibility. The mixed methods findings showed expansion with central overlapping commonality as well as broader non-overlapping interpretations. Specifically, *Project-level suggestions* complemented the survey by offering detailed suggestions for future program. In addition, *Service-level considerations* partially related to the survey on the *recommendation* and parents' *perceived competence* and *self-efficacy* but complemented the survey on *Cost* and *Perceived Effectiveness of Intervention*.

3.4 Discussion

The current study aimed to investigate Chinese parents' experience of participation in a 12-week group-based parent coaching intervention based on the Parent-mediated Early Start Denver Model and delivered via telehealth. We employed a mixed-methods approach using the post-intervention survey and focus groups to evaluate the program implementation from parents' perspectives. The mixed methods findings provided detailed understandings of the elements or ingredients that determined the implementation success in this culturally adapted program. It revealed (1) the elements of this program that were acceptable to parents, such as program content, design, delivery, participation, and group therapy; (2) how this telehealth program met parents' needs or addressed their problems (via family-centered care, home-based intervention, strategies relative to daily activities, remote learning platform, and program-based community); and (3) what practical elements made this program feasible for parents to implement, such as parent modeling, step-by-step instruction, learning by doing, formative and tailored feedback, and peer learning. Findings of this study have implications for better understanding of the telehealth delivery of evidence-based autism-related services among Chinese parents, such as P-ESDM. Results are discussed below.

Overall, parents across groups rated the elements of program implementation (i.e., satisfaction, recommendation, acceptability, appropriateness, and feasibility) positively. Most parents rated the program's difficulty levels as moderate, believing that there was some background knowledge required for participation. The majority of parents used the program less than four times per week. Despite the fact that parents in the treatment group had significantly higher scores in total perceived competence on the skills gained during the intervention, there was no group difference in self-efficacy. The observed increase in total perceived competence in

the treatment group could result from the group therapy itself. Another possible explanation for this might be that fewer people in the self-directed condition completed the intervention compared to the treatment group, with the intervention completion ratio 57% to 94%, respectively. However, the findings suggest that parents in both groups had a comparable level of confidence in their ability to carry out the intervention skills after the program, even though parents in the self-directed condition had lower total perceived competence scores and fewer people completed the intervention. Self-efficacy was considered as a predictor of health behavior change and maintenance (Champion & Skinner, 2008; Rosenstock, 1974). According to Strecher et al. (1986), health care professionals can influence self-efficacy, and changes in self-efficacy were associated with changes in behavior. Taken together, these findings indicate that parents, whether they participated in group therapy or not, had a similar chance of initiating and maintaining health behavioral change after this telehealth program.

Telehealth created opportunities to deliver acceptable and appropriate services for children with disabilities, particularly during the COVID-19 pandemic (Camden & Silva, 2021; Rao, 2021). Our findings indicated that Chinese parents showed a high level of satisfaction and acceptability to this modified group-based parent coaching program based on P-ESDM. Moreover, the program content, design, delivery, participation, and group therapy were five aspects that parents considered when evaluating the program's acceptability. The evaluation was mainly based on whether their needs, preferences, or expectations differed (Proctor et al., 2011). Specifically, tailored feedback, demonstration and commentary videos, peer commenting, live coaching, and guided reflection were top five telehealth strategies strongly endorsed by the majority of Chinese parents. With opportunities in pediatric telehealth created by the COVID-19 pandemic for families of children with disability (Camden & Silva, 2021), therapists need to

learn more about acceptable telehealth strategies and adopt them in order to engage families in exploring how telehealth can best meet their needs.

Despite the numerous advantages of telehealth services, there are still challenges to overcome. Firstly, the availability of equipment and a stable Internet connection are key factors for the implementation of telehealth interventions. Although telehealth interventions have been successfully implemented in rural areas (Guðmundsdóttir et al., 2018; Parsons et al., 2017), barriers to adopting telehealth services continue to exist globally (Scott Kruse et al., 2018). Secondly, difficulties related to technology and infrastructure might restrict the benefits of telehealth services. Some studies have documented technological challenges, such as audio delays, dropouts, and audio or video lag during videoconferencing (Banbury et al., 2018). In our study, the shortage of digital devices, App compatibility, slow Internet speeds, and stream latency were negative technology issues experienced by parents during the intervention. This could be a possible explanation for a relatively lower average score (3.91±.89) in item 7, the Appropriateness of Telehealth Delivery, compared to other items in the program evaluation survey. Thirdly, future research or service providers need to explore strategies to promote parent engagement and completion for telehealth interventions. McGarry et al. (2020) reported a low completion rate, with only four of the eleven enrolled parents completing all five online learning modules. Ingersoll and Berger (2015) found that both the self-directed and therapist-assisted groups had high levels of parent engagement and satisfaction with ImPACT program, but having a therapist increased engagement and resulted in a higher completion rate. The same pattern was found in our study, a higher proportion of parents in the web + group therapy condition (94%) completed the online program compared to the self-directed condition (57%). This might suggest that a low dosage assistance from therapists may support parents' engagement and completion.

Another ethical concern in the usage of telehealth is patient privacy and information security, which requires therapists following regional telehealth guidelines and policy and paying attention to ethical issues to provide a safe telepractice.

The program's appropriateness and feasibility were critical when delivering early intervention via digital service because it required extensive parental involvement. As Rao (2021) described the paradigm in pediatric service delivery would shift from a home-based model to a family-centered approach, parents became the person who implemented the intervention (Oono et al., 2013). Parents judged appropriateness from a technical or social standpoint based on whether their problems were solved, or their goals were met. Our finding indicated that P-ESDM was suitable for Chinese families with a child newly diagnosed with ASD. Parents were able to integrate home-based strategies into daily activities, and the remote learning platform increased the accessibility to both services and professionals. Long work hours, unexpected interruptions from life events, a lack of in-person observation, and a lack of face-to-face communication were barriers in this program. Feasibility was evaluated by practical experience of parents if a task can be performed relatively easily (Proctor et al., 2011; Proctor et al., 2009). The combination of the asynchronized lectures, demonstration and commentary videos in a video-based platform enabled parents to learn the skills through modelling and instructions. The formative and tailored feedback corrected and guided parents' practice. In addition, the synchronized videoconferencing group sessions provided parents with peer learning experience. All the components mentioned above helped parents successfully implement intervention techniques with their child at home.

Group-based therapy provided psychosocial support for parents of a child with autism(Farmer & Reupert, 2013), and videoconferencing was an acceptable and feasible

approach of delivery for group-based interventions in this population (Lodder et al., 2020; Parsons et al., 2017). In a recent systematic review (Sutherland et al., 2018), parent satisfaction was reported as an outcome variable in nine of fourteen studies, and only three studies were intervention design via telehealth, with all three reporting a high level of satisfaction (Hepburn et al., 2016; Ingersoll & Berger, 2015; Pickard et al., 2016). However, none of these three studies were conducted in a group setting. An in-person parent program was conducted in a group basis, and parents reported that the main benefit of the program was "meeting other parents having similar experience and sharing ideas" (Williams et al., 2020). Peer bonding and support were critical for parents of a child with autism, particularly those who were newly diagnosed. Parents in Lodder et al. (2020) reported that the advantages of videoconferencing outweigh the disadvantages and suggested that a hybrid format is best. More importantly, the home-based telehealth was reported as the lowest cost when compared to in-home therapy and clinic-based telehealth format for ABA service (Lindgren et al., 2016). Overall, this study was one of the few studies which provide parent coaching intervention in a group-based setting via videoconference to parents of children with autism. Our findings demonstrated that the telehealth delivery format was acceptable to Chinese parents. Despite certain suggestions and concerns for better serving parents' needs, this group-based parent coaching intervention might be a successful program and a promising method of delivery for a low-resource population, such as Chinese parents.

Group-based programs delivered by telehealth would potentially become a more affordable option for Chinese families with a child diagnosed with ASD. According to Guo (2014), only 13.8% of parents considered the cost of their child's rehabilitation or education as affordable, 55% of parents were satisfied with the professionals or the service provided. Moreover, over half of 3867 families studied (54%) indicated that one parents had to give up

work due to their child's ASD diagnosis. This condition undoubtedly increased financial risk for families who were already in crisis. In our study, 78% of families (25/32) had a monthly family income of less than $3,000. Perhaps not surprisingly, cost emerged as a subtheme that complemented the survey outcomes. For example, parents stated the remote program was cost-efficient for them. Limited availability of services in the healthcare and educational systems and a pervasive shortage of resources are key factors in the financial burden faced by parents (Sun, Allison, Auyeung, et al., 2013). Parents reported in our study that they faced additional expenses as they explored available healthcare resources, for example, costs associated with traveling to another city for services. According to a recent qualitative study, the fidelity of online parent training during the COVID-19 pandemic in China was limited by inexperienced teachers, and tensions between inexperienced teachers and parents demanded more culturally-relevant instructional materials (McDevitt, 2021). Under such circumstances, a well-structured, culturally adapted parent program via telehealth may offer a promising solution. More research is needed to determine the feasibility and effectiveness of such programs or instructional materials across a variety of contexts.

The mixed methods findings provided suggestions for improving future iterations of the program. Project-level suggestions and service-level considerations complemented the quantitative results by emphasizing the need to personalize treatment to optimize outcomes and proposing a potential solution to establish a group-shared platform for longer sustainability. Those results indirectly reflect there is a great need for high-quality early intervention services in mainland China. Future studies should include components or strategies to improve parent engagement and participation, such as practice manuals, homework, and tailored feedback. Such programs should be adjustable in the difficulty level with an acceptable and a manageable dosage

to avoid putting additional strains on parents. Furthermore, strategies and methods that can be used to advance personalized interventions need to be further investigated to better serve children at different stages of development and families with diverse characteristics.

3.4.1 Limitations

There were several limitations in the current study. Firstly, despite efforts to recruit families from a variety of demographic profiles, most participating families included parents with a college degree or higher. The telehealth program excluded those families who did not have access to the internet or digital devices. Second, although it is typical for a convergent design to have the qualitative sample nested within the quantitative sample, most responses from the focus groups came from parents who completed the intervention. We were able to invite one parent from each group who did not complete the program to contribute their views. There was a lack of information from those who did not complete the program or dropped out. More research is needed to discover why some parents dropped out or did not finish on time. Future telehealth research should consider including web-activity data to gain a better understanding of digital service usage and intervention dosage, such as the number of unique views and minutes viewed on intervention videos. Furthermore, for future research, a user-friendly learning platform and Internet access may be critical factors in telehealth program participation.

3.4.2 Conclusion

The current study used a mixed methods approach to better understand parents' evaluation on the implementation outcomes of this modified telehealth intervention. Parents in both the self-directed and web + group therapy conditions had positive perceptions in program satisfaction, acceptability, appropriateness, feasibility, and recommendation. Both groups

reported high parent perceived competence and self-efficacy, and group-based parent coaching session increased parent perceived competence. Findings indicate the application of telehealth was acceptable, appropriate, and feasible for Chinese parents. It may suggest the possibility of using telehealth as a service delivery option. In addition, group-based parent coaching intervention could be a promising home-based service model to increase parental perceived competence. Future research should continue to identify culturally appropriate PMI for parents in low-resource contexts, and a large scale RCT is needed to investigate the effectiveness of group-based PMI via telehealth. More studies are urgently needed to develop and evaluate the feasibility and effectiveness of this type of intervention during and after the COVID-19 pandemic in resource-limited communities.

Table 3.1 Convergent Mixed Methods Design Diagram

	QUANTITATIVE		QUALITATIVE
Participant	N=32		N=24
Data Resource	Program Evaluation Survey Close-ended questions 32 items	Matching Strategy →	5 Focus Groups Open-ended questions 15 prompts
Analytic Approach	Descriptive Statistics Independent t-test		Thematic Analysis
Data Integration	Merging Strategy: Thematic Conceptualization of Statistic Results Statistics by Theme Joint Display		

Table 3.2 Demographic Characteristics of Participants in Program Evaluation Survey and Focus Group

Characteristics	Program Evaluation Survey			Focus Group		
	Self-directed Web (n=14)	Web + Group therapy (n=18)	Total (n=32)	Self-directed Web (n=7)	Web + Group therapy (n=17)	Total (n=24)
Participant Relation, N (%)						
Mother	13 (92.86)	14 (77.78)	27 (84.38)	7 (100.00)	13 (76.47)	20 (83.33)
Adoptive Mother	0 (0.00)	1 (5.56)	1 (3.13)	0 (0.00)	1 (5.88)	1 (4.17)
Father	1 (7.14)	3 (16.67)	4 (12.50)	0 (0.00)	3 (17.65)	3 (12.50)
Intervention Completion Ratio						
Sample ratio	8:14 (.57)	17:18 (.94)	25:32 (.78)	6:7 (.85)	16:17 (.94)	22:24 (.91)
Child Age (years),						
Mean±SD	3.08±0.77	3.23±0.98	3.16±0.88	3.34±0.87	3.29±0.97	3.31±0.93
Range	1.68-4.62	1.70-5.16	1.68-5.16	2.37-4.62	1.70-5.16	1.70-5.16
Child Sex, N (%)						
Males	12 (85.71)	15 (83.33)	27 (84.38)	6 (85.71)	14 (82.35)	20 (83.33)
Females	2 (14.29)	3 (16.67)	5 (15.63)	1 (14.29)	3 (17.65)	4 (16.67)
Child Verbal, N (%)						
Nonverbal	9 (64.29)	12 (66.67)	21 (65.63)	3 (42.86)	11 (64.71)	14 (58.33)
Verbal	5 (35.71)	6 (33.33)	11 (34.38)	4 (57.14)	6 (35.29)	10 (41.67)
ADI-R, Mean±SD						
Social impairment	20.86±3.39	19.39±4.24	20.03±3.91	20.86±4.10	19.24±4.32	19.71±4.24
Communication	10.79±1.97	9.44±2.89	10.03±2.58	10.71±2.43	9.47±2.98	9.83±2.84
Repetitive interest	3.50±1.83	3.44±1.95	3.47±1.87	3.86±1.95	3.35±1.97	3.50±1.93
Family structure, N (%)						
Nuclear Family	5 (35.71)	3 (16.67)	8 (25.00)	2 (28.57)	3 (17.65)	5 (20.83)
Three Generations Family	9 (64.29)	14 (77.78)	23 (71.88)	5 (71.43)	13 (76.47)	18 (75.00)
Other	0 (0.00)	1 (5.56)	1 (3.13)	0 (0.00)	1 (5.88)	1 (4.17)
Monthly Family Income, N (%)						
<460 Dollars	1 (7.14)	1 (5.56)	2 (6.25)	0 (0.00)	1 (5.88)	1 (4.17)
460-770 Dollars	0 (0.00)	2 (11.11)	2 (6.25)	0 (0.00)	2 (11.76)	2 (8.33)
770-1540 Dollars	4 (28.57)	4 (22.22)	8 (25.00)	2 (28.57)	4 (23.53)	6 (25.00)
1540-3080 Dollars	6 (42.86)	7 (38.89)	13 (40.63)	2 (28.57)	6 (35.29)	8 (33.33)

3080-7690 Dollars	3 (21.43)	4 (22.22)	7 (21.88)	3 (42.86)	4 (23.53)	7 (29.17)
Location, N (%)						
Urban	12 (85.71)	15 (83.33)	27 (84.38)	6 (85.71)	14 (82.35)	20 (83.33)
Rural	2 (14.29)	3 (16.67)	5 (15.63)	1 (14.29)	3 (17.65)	4 (16.67)
Mother's Education, N (%)						
High school or below	1 (7.14)	1 (5.56)	2 (6.25)	0 (0.00)	1 (5.88)	1 (4.17)
Junior college	4 (28.57)	6 (33.33)	10 (31.25)	3 (42.86)	6 (35.29)	9 (37.50)
Undergraduate	7 (50.00)	8 (44.44)	15 (46.88)	2 (28.57)	7 (41.18)	9 (37.50)
Graduate or above	2 (14.29)	3 (16.67)	5 (15.63)	2 (28.57)	3 (17.65)	5 (20.83)
Mother's Employment, N (%)						
Full-time	5 (35.71)	10 (55.56)	15 (46.88)	2 (28.57)	9 (52.94)	11 (45.83)
Part-time	0 (0.00)	1 (5.56)	1 (3.13)	0 (0.00)	1 (5.88)	1 (4.17)
Unemployed	9 (64.29)	6 (33.33)	15 (46.88)	5 (71.43)	6 (35.29)	11 (45.83)
Self-employed	0 (0.00)	1 (5.56)	1 (3.13)	0 (0.00)	1 (5.88)	1 (4.17)

Table 3.3 Examples of Matching Survey Questions to Focus Group Prompts

Program Evaluation Survey	Focus Group Prompts
Program implementation	1. What is your overall perception of this web-based program? For example, the program content, Telehealth format.
Satisfaction (1)	2. What are your favorite parts of this web-based program? For example, topics covered in the program, learning materials, how the program run, etc.
Recommendation (15)	3. What do you dislike most about this web-based program? For example, topics covered in the program, learning materials, how the program run, etc.
Acceptability (2,3)	4. What aspects of this web-based program do you think meet your expectations? Or what aspects meet the needs of you and your family?
Appropriateness (4,5,11)	5. What are your favorite and least favorite parts about the remote learning? And why? e.g., compared with in person learning?
Feasibility (2,3,4,5,11,12)	6. During the intervention, which parts do you find difficult to learn? Which parts are relatively easy?
Program Difficulty (6,8)	7. What do you feel about the intensity of current program? Do you think you can keep up or not? Any reasons for that?
Background Needed (9)	8. What barriers did you experience during the intervention? Any difficulties? Or burden? For example, time, energy, participation, software, and hardware, etc.
Frequency (7)	9. What did you think about having a coach? Is it necessary? In the beginning or later?
Perceived competence and self-efficacy	10. What if, the program is not funded by research, are you willing to participate? e.g. Any considerations?
Perceived Competence (13)	11. (Treatment group) What did you think about the group session? What are your favorite and least favorite parts?
Self-efficacy (13)	12. (Treatment group) What support do you get from other parents in the group sessions?
	13. What, if any, benefits, or achievements do you have during the intervention? e.g., Parental skills, parent-child interaction.
	14. How could the program have been improved to help you more?
	15. What types of families do you think this program might work best for?

Table 3.4 The Skewness and Kurtosis of Items in Program Evaluation Survey

	Self-directed Web (n=14)				Web + Group therapy (n=18)			
	Skewness		Kurtosis		Skewness		Kurtosis	
	Statistic	Std.Error	Statistic	Std.Error	Statistic	Std.Error	Statistic	Std.Error
Satisfaction Program Content	-0.32	0.60	-2.24	1.15	-1.46	0.54	0.14	1.04
Satisfaction Telehealth Delivery	-0.43	0.60	-0.39	1.15	-0.50	0.54	-1.99	1.04
Recommendation	-1.89	0.60	4.67	1.15	-1.26	0.54	-0.34	1.04
Acceptability Program Content	0.03	0.60	0.21	1.15	-0.24	0.54	-2.20	1.04
Acceptability Telehealth Delivery	0.32	0.60	-2.24	1.15	-0.50	0.54	-1.99	1.04
Appropriateness Program Content	0.00	0.60	-2.36	1.15	-0.24	0.54	-2.20	1.04
Appropriateness Telehealth Delivery	0.41	0.60	-0.76	1.15	-0.32	0.54	-1.24	1.04
Feasibility Program Content	-0.32	0.60	-2.24	1.15	-0.24	0.54	-2.20	1.04
Feasibility Telehealth Delivery	-0.11	0.60	-0.86	1.15	-0.62	0.54	-0.39	1.04
Program Difficulty	0.32	0.60	-0.63	1.15	0.65	0.54	-0.21	1.04
Background Needed	-0.66	0.60	-1.56	1.15	-0.48	0.54	-0.95	1.04
Frequency of Learning	0.52	0.60	-0.73	1.15	1.11	0.54	2.60	1.04
Total Perceived Competence	-1.16	0.60	0.93	1.15	0.15	0.54	-1.41	1.04
Total Self-efficacy	-1.55	0.60	1.51	1.15	-0.21	0.54	-1.12	1.04

Table 3.5 Average Scores on Program Evaluation Survey Items between Groups (Mean ± SD)

	Self-directed (N=14)	Web + Group therapy (N=18)	Total (N=32)
Satisfaction Program Content	4.36±.63	4.61±.50	4.50±.57
Satisfaction Telehealth Delivery	4.57±.51	4.78±.42	4.69±.47
Recommendation	4.43±.68	4.75±.43	4.61±.56
Acceptability Program Content	4.43±.51	4.61±.50	4.53±.51
Acceptability Telehealth Delivery	4.21±.58	4.56±.51	4.41±.56
Appropriateness Program Content	4.50 ±.52	4.56±.51	4.53±.51
Appropriateness Telehealth Delivery	3.57±.94	4.17±.79	3.91±.89
Feasibility Program Content	4.57±.51	4.56±.51	4.56±.50
Feasibility Telehealth Delivery	4.07±.73	4.44±.62	4.28±.68
Program Difficulty	2.79±.70	3.11±.96	2.97±.86
Background Needed^	3.29±.91	3.67±1.08	3.50 ±1.01
Frequency	1.71±.72	1.89±.76	1.81±.74
Total Perceived Competence	30.14±14.78	38.72±8.14*	34.97±12.11
Total Self-efficacy	35.00±16.43	41.22±7.30	38.50±12.34

Note. ^: reversed score, *: $p < .05$

Table 3.6 Qualitative Results of Focus Group Interviews Presented by Themes, Subthemes, and Codes (Chinese and English)

Themes	Subthemes	Codes
Acceptability 接受程度	Content 教学内容	1.1.1 Positive Overall Perception 整体感受好 1.1.2 Professional 教学内容专业 1.1.3 Systematic 教学内容成体系 1.1.4 Substantial 教学内容丰富 1.1.5 Digestible 教学内容可接受 1.1.6 Focused on Key Points 教学内容重点突出 1.1.7 Favorite Techniques: Sensory Social Routines (Physical Play), Gestures (Nonverbal Communication), Joint Attention 最喜欢的技能：感觉社交常规活动 (身体游戏）、手势 (非口语交流），共同注意力 1.1.8 Challenging Techniques: Joint Attention, Set A Theme for Activities, Follow the Child's Lead 有挑战的技能：共同注意力，制定活动主题，跟随孩子
	Design 教学设计	1.2.1 Clear Structure 教学设计结构清晰 1.2.2 Easy to Follow 教学设计层次性 1.2.3 Innovative 教学设计创新性 1.2.4 Acceptable Dosage 课时合理 1.2.5 Topics Sequencing in Progression (Easy – Hard) 教学过程难度循序渐进 1.2.5 Motivating 教学过程激励性 1.2.6 Favorite Components: Tailored Feedback / Demo & Commentary Videos /Peer Commenting 最喜欢的教学环节：量身定制的反馈、实操及解说视频、小组成员互评
	Delivery 教学实施	1.3.1 Increased Access to Service and Professionals 增加获得专家指导和服务的机会 1.3.2 Alternative Due to Covid Restrictions 疫情防控下的优质选择 1.3.3 No Locations & Space Restrictions 教学实施不受地理环境限制 1.3.4 Time Efficient 教学实施的时间成本低 1.3.5 High Demands on Internet 对互联网通讯质量要求高 1.3.6 Technology Dependent 对教学软件硬件要求高
	Participation 学习参与	1.4.1 Empowering and Strength-Based 基于优势激发的参与能动性及赋能 1.4.2 Effective, Direct Learning-Focused Feedback 基于学习情况的有效反馈 1.4.3 Progression Rate Different Between Parents and Children 家长和孩子学习进阶掌握情况参差 1.4.4 Need Time to Practice the Techniques 需要时间练习技巧 1.4.5 Homework: Reflective Assignment 家庭作业：反思性作业 1.4.6 Homework: Children Not Willing to Participate 家庭作业：孩子参与意愿低 1.4.7 Homework: Target Behaviors Not Recorded 家庭作业：没有拍摄到目标行为 1.4.8 Homework: Failure Practice Not Reviewed 家庭作业：失败的实操无法得到评价 1.4.9 Homework: Lack of Family Support 家庭作业：缺乏家庭支持

	Group Therapy† 小组学习	1.5.1 Alleviate Stress 缓解压力 1.5.2 Interactive Learning Climate 互动的学习氛围 1.5.3 Direct Coaching 直接的辅导 1.5.4 High Engagement 参与度高 1.5.5 Commitment 忠实度 1.5.6 Favorite Group Activities: Guided Reflection, Peer Commenting, Live Role Play/Coaching 最喜欢的小组活动：有引导的反思、同学间互评、线上角色扮演、现场直播辅导
Appropriateness 适合程度	Family-centered Care 以家庭为核心的医疗	2.1.1 Family Involvement 家庭参与 2.1.2 Parent-Child Interaction and Relationship Building 亲子互动及关系构建 2.1.3 Focus on Parent Mental Health 关注家长心理健康 2.1.4 Limited Parent-Child Interaction at Home Due to Work 工作原因导致亲子互动有限
	Home-Based Intervention 基于家庭环境的干预	2.2.1 Home Setting 基于家庭情境 2.2.2 Flexibility 灵活 2.2.3 Convenience 便捷 2.2.4 Attitude Changes Towards Intervention 对行为干预的态度转变 2.2.5 Interrupted by Life Chores 家庭琐事干扰
	Strategies Relative to Daily Activities 日常活动相关的干预策略	2.3.1 Teaching and Learning Through Daily Routines 通过日常生活进行教与学的活动 2.3.2 Child-Led Mindset 孩子主导的干预思维 2.3.3 Integration in Daily Routine 干预技巧可融入日常生活
	Remote Learning Platform 远程学习平台	2.4.1 Learning Material on Demand Available 学习资料的可获得 2.4.2 Supplement the Limited Local Support 对当地有限资源的补充 2.4.3 Lack of In-Person Observation 缺乏现场观摩 2.4.4 Lack of Instant Feedback 缺乏即时反馈 2.4.5 Accessibility 无障碍
	Program-Based Community† 基于项目的共同体	2.5.1 Social Emotional Support 社会情感支持 2.5.2 Mental Health Promotion 心理健康促进 2.5.3 Experience Sharing 经验分享
Feasibility 可行程度	Parent Modeling 家长操作展示	3.1.1 Intuitive 直观 3.1.2 Doable 可操作
	Step by Step Instruction 循序渐进的引导	3.2.1 Strong Parental Involvement 家长参与程度高 3.2.2 Focused on Parent-Mediated Strategies 关注以家长为中介的干预策略

	Learning by Doing 实践中学习	3.3.1 Naturalistic Teaching 自然场景教学 3.3.2 Easy to Use 易上手 3.3.3 Implementable 可执行 3.3.4 Practice-Based 勤练习
	Formative and Tailored Feedback 规范的定制化反馈	3.4.1 Verification 检验准确 3.4.2 Elaboration 阐述详尽 3.4.3 Delayed Feedback 反馈延迟
	Peer Learning† 组内学习	3.5.1 Group Activities 小组活动 3.5.2 Peers Commenting and Mentoring 同学互评及指导
Project-Level Suggestions 项目层面建议	Personalized Design 个体化设计	4.1.1 Individualized Progression 个性化学习进度 4.1.2 Problem-Based Learning 问题导向的学习 4.1.3 Function Centeredness 以功能中心 4.1.4 Live Coaching 现场直播指导
	Advanced Program in Need 高阶项目需求	4.2.1 Specialized Program (Motor-Specific, Language Promotion, Adaptive Skills Program) 特定项目需求 (动作能力项目、语言能力提升项目、适应性技能项目） 4.2.2 Group Program for Children 面向孩子的小组项目 4.2.3 In Person Program 线下项目
	Group-Shared Platform for Maintenance 建立分享式平台以维持小组	4.3.1 Extend the Access to The Program 增加参与时长 4.3.2 Keep the Group 维持学习小组 4.3.3 More Group Session 增加小组讨论的环节 4.3.4 Establish Shared Practice Video Library or Toy Collection 建立分享式实操视频库或玩具库
Service-Level Considerations 服务层面考虑	Cost 代价	5.1.1 Willingness to Pay 付费学习的意愿 5.1.2 High Demand on High Quality Service 对高质量服务的高需求 5.1.3 Specialist Dependent 对专家教学引导的依赖 5.1.4 Therapist to Patient Ratio 治疗师与患者比例 5.1.5 Cost Efficient for The Remote Learning 远程学习的成本效率
	Timeliness 时效性	5.2.1 Newly Diagnosed Family 新进确诊家庭 5.2.2 Family with Young Children Aged 2-5 2-5 岁孩子的家庭 5.2.3 Family with Low Resource 低资源的家庭 5.2.4 Family of Child Not on Spectrum 非谱系孩子的家庭
	Perceived Effectiveness 有效性	5.3.1 Knowledge of ASD and Beliefs about Early Intervention 对自闭症早期干预的信念及相关知识 5.3.2 Individual Stage of Change: Gains on Child, Parent, Parent-Child Interaction 个体变化程度：孩子和家长的进步、亲子关系改善 5.3.3 Improvement in Self-Efficacy and Mental Health 自我效能和心理健康水平的改善

Note. †: subthemes emerged from responses within parents in the treatment group (Web + group therapy)

Table 3.7 Joint Display of the Quantitative and Qualitative Findings with Meta-inferences

Quantitative (Mean ± SD)		Qualitative		Meta-inferences
		Themes	Subthemes	Interpretation of mixed methods findings
4.53±.51	Program Content	Acceptability	Content Design Delivery Participation Group Therapy†	The subthemes suggested various aspects of the program was acceptable for parents based on their personal experience and perception. It was confirmed by the high average scores in both items under *Acceptability*.
4.41±.56	Telehealth Delivery			
4.53±.51	Program Content	Appropriateness	Family-centered Care Home-based Intervention Strategies Relative to Daily Activities	The subthemes represented how this program met parents' needs or addressed their problems. Comments in *Remote learning platform* was relatively neutral due to technical issues which confirmed a lower average score in the telehealth delivery item, compared to program content item, under *Appropriateness.*
3.91±.89	Telehealth Delivery		Remote Learning Platform Program-based Community†	
4.56±.50	Program Content	Feasibility	Parent Modeling Step by Step Instruction Learning by Doing Formative and Tailored Feedback Peer Learning†	The subthemes listed all practical elements that made this program implementable for parents. It was confirmed by the high average scores in both items under *Feasibility*.
4.28±.68	Telehealth Delivery			
N/A	N/A	Project-Level Suggestions	Personalized Design Advanced Program in Need Group-Shared Platform for Maintenance	This qualitative theme complemented the survey outcomes with expansions on suggestions for future program.
N/A	N/A	Service-Level Considerations	Cost	The subtheme complemented the survey outcome on cost for similar service.
4.61±.56	Recommendation		Timeliness	This subtheme confirmed with the average score under *Recommendation* with detailed family profiles.
34.97±12.11	Perceived Competence		Perceived Effectiveness	This subtheme complemented the survey outcomes with expansions on the effectiveness of intervention. The subtheme partially related to the outcomes on parents' perceived competence and self-efficacy with a broader nonoverlapping aspects, such as attitude towards such service.
38.50±12.34	Self-Efficacy			

Note. †: subthemes emerged from responses within parents in the treatment group (Web + group therapy)

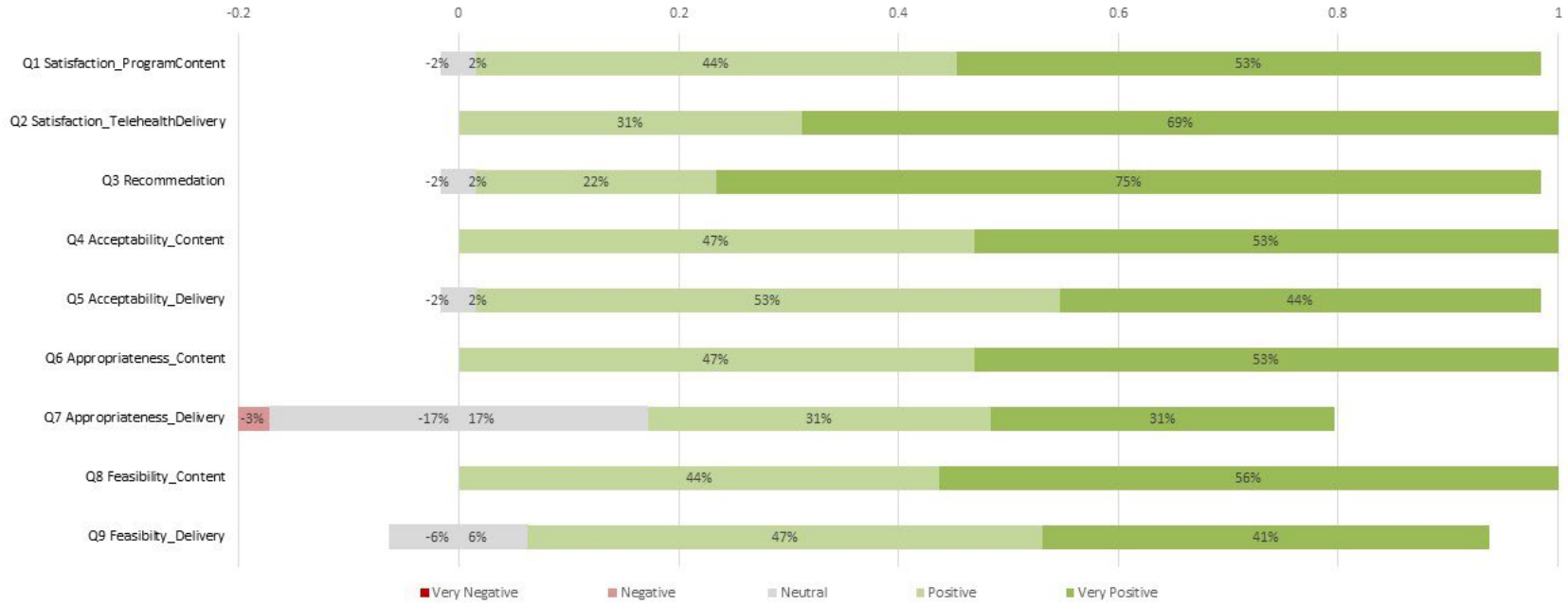

Figure 3.1 The Percentage of Ratings on Item 1 to Item 9 in Program Evaluation Survey

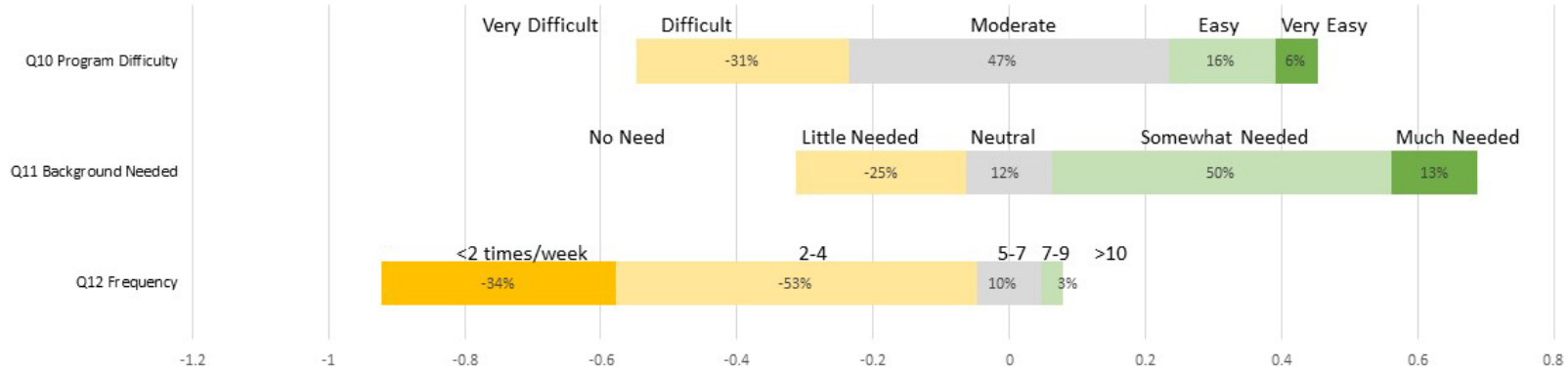

Figure 3.2 The Percentage of Ratings on Item 10 to Item 12 in Program Evaluation Survey

Chapter 4 Alleviating Stress and Anxiety Outcomes for Parents of Children with Autism Through a Culturally Adapted Telehealth Intervention: A Pilot Study

4.1 Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disability characterized by impairments in social interaction and communication and by the presence of restricted, repetitive behaviors and interests (American Psychiatric Association & Association., 2013). Autism affects at least 78 million individuals around the world (Lord et al., 2022; Lord et al., 2018), and that is over 1% of worldwide population according to the World Health Organization (World Health, 2013). Specifically, children with autism often exhibit co-occurring conditions, both behavioral and emotional, including tantrums, sleep disturbances, gastrointestinal issues, and irritability (O'Nions et al., 2018), with approximately 50% showing coexisting problems, such as anxiety and ADHD (Petrou et al., 2018).

Parents of children with autism experience higher levels of stress (Barroso et al., 2018) and other negative affects compared to parents of typically developing children, and also higher than parents of children with other disabilities (Estes et al., 2009; Hayes & Watson, 2013; Phetrasuwan & Shandor Miles, 2009). Parents of children with autism started to report high levels of stress after the diagnosis of their children (Gupta, 2007; Meirsschaut et al., 2010). From then, the severity of the child's autism symptoms (Ingersoll & Hambrick, 2011; Kasari et al., 1997; Lyons et al., 2010) and the co-occurring behavior problems (Lecavalier et al., 2006; McStay, Dissanayake, et al., 2014; McStay, Trembath, et al., 2014) were two main causes reported to be associated with levels of parenting stress. Highly stressed parents are more likely

to experience other mental health problems, such as depression and anxiety, due to the impact chronic stressors can have on their cardiovascular, immune, and gastrointestinal systems (Miodrag & Hodapp, 2010). Elevated levels of depression and anxiety were also reported by parents of children with autism (Padden & James, 2017), leading to a lower quality of life (Vasilopoulou & Nisbet, 2016) and decreased parenting self-efficacy (Giallo et al., 2013).

Parents of children with autism in China reported elevated parenting stress as western parents (Lu et al., 2015). However, Chinese mothers' parenting stress was associated not only with the child's behavioral symptoms but also with the limited medical and educational resources and financial burden (Wu et al., 2015). In 2015, China's pediatricians were just 100,000 and rehabilitation-related therapists, including physical and occupational therapists, were less than 30,000 (Wu et al., 2015). Shi et al. (2019) reported there were 30122 psychiatrists in China by the end of 2015, with child psychiatrists less than 500 (Wu & Pan, 2019). Until January 2022, there were 100 registered BCBAs and 7 BCBA-Ds in China according to the Behavior Analyst Certification Board Registry (Board, 2022). The scarcity of specialists affects timely diagnosis and leads to delayed treatments and limited evidence-based services in China (Su et al., 2013; Xiong et al., 2011). McCabe (2012) discovered that intervention services for autism in China often used a mix of methods, and evidence-based practices coexisted with self-designed interventions (Clark et al., 2019). Liu et al. (2020) conducted a systematic review examining evidence of parent-mediated interventions in China. Only four identified programs (4/21) met the criteria in using evidence-based intervention models, and 3 of 21 identified studies reported the use of cultural adaptation, and over half (14/21) of the included studies failed their quality evaluation. According to a recent qualitative study, the fidelity of online parent training during the COVID-19 pandemic in China was limited by inexperienced teachers, and tensions between

inexperienced teachers and parents demanded more culturally-relevant instructional materials (McDevitt, 2021). Under such circumstances, a well-structured, culturally adapted parent program via telehealth may offer a promising solution.

The mental disorder stigma, low autism awareness, and limited knowledge about autism symptoms in China prevent parents from seeking professional help (Fisher & Shang, 2013; Guo, 2014; Huang et al., 2013; Su et al., 2013; Wu et al., 2015; Xiong et al., 2011). For example, there was only 9% of parents who noticed child's atypical early behaviors chose to seek professional help immediately (Sun et al., 2015). Instead, Chinese parents are more likely to seek help from non-professionals (relatives, family, and pastors) (Wu et al., 2015). About 80% of parents chose to "wait and see" if their children outgrew autism symptoms (Huang et al., 2013). Families who did seek treatment for their children experience service delivery barriers such as costly intervention, a longer waitlist for enrolment, and time-consuming intensive programs (Chang & Zaroff, 2017; B. Zhou et al., 2018). In addition, health insurance coverage, parents' time limits, and geographical barriers prevent parents from accessing parent training or parent support services. There is great need for interventions that are high-quality, culturally appropriate, accessible, and affordable to children with autism and their families in China.

Studies suggested that a parent psychoeducational (PPE) training (DaWalt et al., 2018; Hemdi & Daley, 2017) can effectively decrease the stress and anxiety level of parents because PPE provides parents with updated knowledge about autism and coping strategies. Meanwhile, the parent-mediated intervention (PMI) can significantly reduce the child's autism severity by age 3 (Ingersoll & Wainer, 2013; Kasari et al., 2015; Oono et al., 2013; Parsons et al., 2017; Stadnick et al., 2015), because it is designed to actively engage parents in therapy delivery to promote skill acquisition or behavior change in the child (Green et al., 2015; Green et al., 2017).

Research suggested that parents can be taught to successfully implement interventions that increased both child outcomes as well as parental outcomes (Baumann et al., 2015; Deb et al., 2020; Hemdi & Daley, 2017; Nevill et al., 2018). Those results have been found in person mode of delivery (Liu et al., 2020; Nevill et al., 2018), in group-based setting (O'Donovan et al., 2019) or in telehealth format (Hemdi & Daley, 2017; Lindgren et al., 2016). Parent coaching has demonstrated its capacity to support families while waiting for intensive early interventions (Abouzeid et al., 2020; Hernandez-Ruiz, 2019). Previous studies have indicated that parent coaching intervention is feasible and acceptable to both parents and providers (Abouzeid et al., 2020; Hernandez-Ruiz, 2019). Moreover, the feasibility of tele-delivered parent coaching intervention has been tested in rural areas (Guðmundsdóttir et al., 2018; Salomone & Maurizio Arduino, 2016), and for underrepresented population (Yllades et al., 2021). Parent coaching intervention enhanced parents' teaching skills (intervention fidelity) (S. J. Rogers et al., 2012) and increased parents' ability to reflect effectively (Hernandez-Ruiz, 2019; Siller et al., 2018).

Early Start Denver Model (ESDM) is an early intervention model based on the developmental and behavioral approaches developed in the US (Rogers & Dawson, 2010). The parent-mediated ESDM (P-ESDM) focused on the quality of social interaction between children with autism and their caregivers, as well as a framework to embed specific objectives across all developmental domains (S. Rogers et al., 2012). Previous research has established P-ESDM has the potential to be delivered successfully through telehealth methods (Vismara et al., 2012) and be adapted to different context (Colombi et al., 2018; Holzinger et al., 2019). Two studies in China examined the effectiveness of P-ESDM on preschoolers with autism in mainland China. Xu et al. (2017) conducted a pilot study examining the efficacy of an 8-week ESDM plus other eclectic intervention services delivered by local teachers. B. Zhou et al. (2018) conducted a non-

randomized trial to compare a 26-week, high-intensity, P-ESDM intervention with a general community-based treatment program using the Chinese version of P-ESDM. Both studies were conducted in a 1-on-1 clinical in-person setting and showed positive results in participating children.

Group-based parent training may help to offset the shortage of professionals in China who specialize in autism-related services. O'Donovan et al. (2019) conducted a systematic review to examine group-based parent training interventions for families of children with autism. According to their findings, group-based parent training interventions improved parent behavior, children's behavior, parent health, and social support. However, with 12 out of 13 included studies falling below the quality rating threshold, O'Donovan et al. (2019) stated that those findings should to be interpreted with caution and be further investigated using better study design and methodology. Banbury et al. (2018) found that health professional-led group videoconferencing was a feasible option for that to provide education and social support into the home setting. Group-based interventions via videoconferencing enhanced accessibility, and the effects of the videoconferencing groups were comparable to those of in-person groups (Banbury et al., 2018).

The majority of parent interventions have been designed to teach parents to apply specific intervention strategies focused on supporting the child (Ingersoll et al., 2016). Interventions designed mainly for the benefit of parents focused only on parental well-being and parenting competence (Ferraioli & Harris, 2013). A critical gap in current parent training studies is that the direct beneficiary of intervention is either solely the child or the parents. Therefore, there is a great need for a parent intervention which can provide both scientific understanding about autism and evidence-based techniques for parents to act early at home.

The present group-based parent coaching intervention was culturally adapted based on P-ESDM. The intervention was delivered via telehealth and tailored to the Chinese context. The intervention taught caregivers how to integrate evidence-based intervention strategies into everyday routines and home activities to improve the mental and physical well-being of their children with autism. In addition to facilitate child development in a natural home environment, the intervention was also designed to improve parental competence and self-efficacy (Chapter3) and alleviate parenting stress and mental health outcomes. The current study aimed to examine the effectiveness of this culturally adapted telehealth intervention on children's adaptive functioning, child behavior, and children's quality of life, as well as the parents' mental health, parenting stress and parenting styles, and parents' quality of life.

4.2 Methods

A randomized controlled trial (RCT) was conducted to explore the effectiveness of two telehealth service conditions on both children's and parents' outcomes. Families of children with autism meeting inclusion criteria were randomly assigned to one of two conditions: the self-directed and the web + group therapy. The self-directed condition received intervention individually through the online learning platform. The web + group therapy condition (treatment) navigated the same online program as the self-directed condition (comparison) with a weekly 1.5 hours group coaching therapy via videoconferencing.

Parent and child outcomes were measured at baseline (T1), post-intervention (T2), and 1-month follow-up (T3). Ethical approval was obtained from Health Sciences and Behavioral Sciences Institutional Review Board at the University of Michigan (HUM00182526).

4.2.1 Participants

Participants were recruited through a digital recruitment portal, 67 signed the consent digitally. 44 families were randomly allocated to either condition based on a simple randomization approach using a computer-generated random group sequence. 37 families were successfully enrolled in the program, while 7 participants declined to enrol before entry (4 from self-directed and 3 from web + Group therapy), reasons were time conflicts (3/7), privacy concerns (1/7), work (1/7), and pregnancy (2/7).

37 parents of a child with a clinical diagnosis of autism made by a local provider within 6 months participated in the study. Participating parents aged above 18 and had access to the Internet and a digital device. Parents provided demographics information and completed a virtual consultation session before entry to the program. The consultation took about 1.5-2 hours to address questions related to participating in the study and complete child's eligibility screening using Modified Checklist for Autism in Toddlers, Revised with Follow-up (Robins et al., 2009) and Autism Diagnostic Interview-Revised (ADI-R) (Lord et al., 1994). All participating children aged between 1.68 -5.16 years old at entry and met or exceeded cut-off scores of 3 on M-CHAT-R/F and cut-off scores of 10 (social interaction), 8 (communication and language), and 3 (restricted and repetitive patterns of behavior or interest) on the ADI-R. The ADI-R interviews were conducted by a trained therapist who completed the ADI-R clinical training.

Table 4.1 presents participants' demographic information. Demographic characteristics were examined for group difference using independent samples t-tests for continuous variables and Chi-square tests for categorical variables. No significant group difference was found at baseline.

4.2.2 Intervention Procedures

Families were randomly assigned to either self-directed web (comparison) or web + group therapy (treatment) condition. Parents in both conditions self-navigated the same online program, the condition varied in if the synchronous group-based parent coaching received. The 12-week program was culturally adapted (See Chapter 2) and delivered in Chinese via the Canvas online learning management system, and each module covers one topic as following: (1) Autism and what to expect, (2) Increasing the child's attention, (3) Sensory social routines, (4) Dyadic engagement, (5) Nonverbal communication, (6) Imitation, (7) ABC's of learning, (8) Joint attention, (9) Play, (10) Pretend play, (11) Speech development, and (12) Program summary. Each module took about 54-92 minutes to complete, with an average duration of 71 minutes. During the intervention, new modules were released on Mondays with four types of learning materials, pre-recorded lectures, demonstration videos, commentary videos, and a module-specific practice manual. Each module had an online Q&A session for parents to ask questions or share their experience. In addition, a module-specific assignment was embedded as an optional for parents to submit, parents who uploaded the video-clips of their practice at home received tailored feedback from the therapist.

Parents in the self-directed web group navigated the program at their own pace. Parents were encouraged to complete one module each week and practice the intervention strategies taught that week at home. Parents who chose to submit homework received individual feedback based on their performance in parent-child interaction video clips taken at home. In addition, parents were able to contact project assistant for technology-related problems.

In addition to the online program, parents in the treatment group received a weekly group-based parent coaching session via videoconferencing. The treatment group was divided into three subgroups based on parents' availability and preference. Each subgroup included 6-7

parents to enable full participation. Interventionist met with each subgroup for 1 session per week through DingTalk, a videoconferencing software. The weekly group therapy session lasted 1.5 hours and used a structured model based on mediated learning principles (Schertz & Horn, 2017; Schertz et al., 2018). Five structured group activities were adopted to guide parent learning (modified from Schertz and Horn (2017)'s Table 5, see Appendix C). All three subgroups followed the same group agenda corresponding to each module (Appendix B). During the intervention, parents in the treatment group attended 11 group therapy sessions, with an average attendance rate of 92%.

4.2.3 Measures

Child's eligibility screening was completed prior the entry to the intervention. A 1.5-2 hours virtual consultation session was held to examine autism risks and symptoms. Child and parent outcome measures were collected digitally through Qualtrics at baseline (T1), immediately post intervention (T2), and 1-month follow-up (T3). All test results were blinded to the interventionist during the intervention.

4.2.3.1 ***Screening Measures***

Modified Checklist for Autism in Toddlers, Revised with Follow-up (M-CHAT-R/F) is a 2-stage parent-report screening tool to assess risk for autism spectrum disorder (Robins et al., 2009). M-CHAT is a valid and reliable screener with high sensitivity and specificity. The M-CHAT-R/F includes a follow-up interview where the parent is asked detailed information about symptoms on the questionnaire. This follow-up interview increases the specificity of the M-CHAT. Total score between 3 and 7 indicates a moderate risk and is administered the Follow-Up. Total score above 8 indicates a high risk.

The Autism Diagnostic Interview-Revised (ADI-R) is a structured interview conducted with the parents of individuals for the evaluation of possible autism or autism spectrum disorders (Lord et al., 1994). The interview can be used for diagnostic purposes and measures behavior in the areas of reciprocal social interaction, communication and language, and patterns of behavior. The scores of severity level for ASD is calculated through the ADI-R algorithm with all three behavioral areas meeting or exceeding the cutoff scores: (1) Social interaction: ≥10; (2) Communication: ≥8 (if verbal) or ≥ 7 (if non-verbal); and (3) Restricted and repetitive behaviors: ≥3.

4.2.3.2 *Child Outcome Measures*

Adaptive Functioning

Vineland Adaptive Behavior Scales-Third Edition. The Vineland Adaptive Behavior Scales- Third Edition, Comprehensive Parent/Caregiver Form (Sparrow et al., 2016) is a 502-item questionnaire designed to be completed by an adult respondent who is knowledgeable about the examinee's everyday adaptive functioning. The adaptive raw scores are computed at the subdomain level and converted to v-scale scores, which are then summed to determine domain scores in standard score format. Comprehensive Parent/Caregiver Form yields standard scores for Communication, Daily Living Skills, Socialization, Motor Skills, and Adaptive Behavior Composite. Higher scores indicate better adaptive skills and the cut-off used to indicate low levels of adaptive functioning is <70. All Comprehensive Form adaptive domains showed excellent internal consistency ($\alpha = 0.94$ -0.99), good test–retest reliability ($r = 0.64$ - 0.94) and good concurrent validity ($r = 0.67$ - 0.81) (Pepperdine & McCrimmon, 2017). The Chinese version of the comprehensive Parent/Caregiver Form is purchased from the publisher with a permission to use digitally during the study period.

Child Behavior: Externalizing and Internalizing

Child Behavior Checklist (CBCL). The CBCL for ages 1.5 to 5 years (CBCL/1.5–5; Achenbach and Rescorla (2004) is a clinical measurement used to assess children's problem behavior. CBCL/1.5–5 asks parents/caregivers to rate 99 specific child behaviors (e.g., Clings) as 0 (Not True of the child), 1 (somewhat or sometimes true), or 2 (very true or often true) and produces scores in Internalizing Problems, Externalizing Problems, and Total Problems. The Chinese version of the parent-reported CBCL were a reliable and valid tool (Liu et al., 2011).

Child Quality of Life

Pediatric Quality of Life Inventory–Fourth Version (Peds-QoL). The Peds-QoL is a measure of health-related quality of life for children and adolescents aged 2 to 18 years (Varni et al., 2001). Caregivers rate a child's overall functioning and the results of the Peds-QoL yield the following subscales: Physical Functioning, Emotional Functioning, Social Functioning and School Functioning. Standard scores, such as Total Score, Physical Health Summary Score and Psychosocial Health Summary Score is calculated. The Peds-QoL has good internal consistency in Chinese population with coefficient alpha ranging from 0.86 to 0.90 (Hao et al., 2010).Parent Outcome Measures

Parent Mental Health

Parent mental health was measured using the Generalized Anxiety Disorder 7-item scale (Spitzer et al., 2006) and Patient Health Questionnaire 9-item scale (Kroenke et al., 2001), Parents who indicated extremely severe depression or anxiety were given further assistance information.

Generalized Anxiety Disorder 7-item Scale (GAD-7). The Generalized Anxiety Disorder 7-item Scale (GAD-7) is a practical self-report anxiety questionnaire, which was designed to

identify generalized anxiety disorder and to assess symptom severity (Spitzer et al., 2006). GAD-7 showed high reliability and validity in primary care patients. GAD-7 scores range from 0 to 21, with scores of >5, >10, and >15 representing mild, moderate, and severe anxiety symptom levels, respectively (Spitzer et al., 2006). The Chinese version of GAD-7 showed excellent reliability ($\alpha = 0.91$) and good validity (ROC analysis) in Chinese population (Zeng et al., 2013).

Patient Health Questionnaire 9-item Scale (PHQ-9). The PHQ-9 is a 9-item depression screening tool (Kroenke et al., 2001). The items rely on DSM-IV criteria for the diagnosis of depression. The PHQ-9 score ranges from 0 to 27, PHQ-9 scores of >5, >10, >15, and >20 represent mild, moderate, moderately severe, and severe depression, respectively. The Chinese version of PHQ-9 showed good reliability ($\alpha = 0.86$) and validity ($r = 0.29$, $p < 0.001$) in Chinese population (Wang et al., 2014).

Parent Quality of Life

WHO Quality of Life Scale (WHOQOL-BREF). The WHOQOL-BREF instrument comprises 26 items adapted from the WHOQOL-100 assessment (Group, 1998). WHOQOL-BREF provides a rapid evaluation on the health-related functions in four domains of health: physical health, psychological health, social relationships, and environment (Group, 1998). The Chinese version of WHOQOL-BREF was officially provided by the WHO-QOL group. The Chinese version of WHOQOL-BREF instrument showed good reliability ($\alpha = 0.73$) and validity (CFI = 0.88) in Chinese population (Zhang et al., 2012).

Parenting Stress and Parenting Styles

Parent Stress Index-4, Short Form (PSI-4, SF). The PSI-SF is a parent-report inventory questionnaire designed to assess the stress associated with parenting in parents of children under the age of 12 years (Abidin, 2012). The PSI-4 short form includes 36 items divided into three

subscales, each contains 12 items: Parental Distress (PD); Parent-Child Dysfunctional Interaction (PCDI); and Difficult Child (DC). Parents rate each item on a five-point scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating more stress. Total raw score above 90 indicates a clinically significant high level of stress (Abidin, 1995). The PSI is a reliable and valid instrument that has been used extensively in both clinical and typical populations (Abidin, 2012). The authors of the study purchased a permission from the publisher to use the Chinese version and obtained the permission to collect data digitally through Qualtrics.

The Parenting Styles and Dimensions Questionnaire (PSDQ). The PSDQ is a 32-item, parent-report questionnaire to evaluate the parenting styles (Robinson et al., 1995). Each item is rated with a 5-point Likert Rating Scale (1 = Never, 5 = Always), with higher scores indicating more frequent use of the described behavior. Scores for 3 types of parenting styles were calculated: Authoritative, Authoritarian, and Permissive. The Chinese version of PSDQ has demonstrated good reliability ($\alpha > 0.62$) and validity (TLI: 0.808 - 0.920, RMSEA: 0.052 - 0.07) and very good internal consistencies across all three subscales in Chinese parents (Fu et al., 2013). Moreover, it was widely used in research involving parents of children with special needs (Phillips et al., 2017; van Steijn et al., 2013).

4.2.4 Statistical Analysis

Statistical analysis were conducted using SPSS 28.0 (Spss, 2016), with significance set at $p < 0.05$. Outcome variables were examined for nonnormality visually using boxplots and statistically using the Shapiro–Wilk Test. Standard scores or Z-scores were used for all the outcome measures when available (i.e., VABS and QoL).

Independent t tests and Chi-square tests were conducted to test if there were statistically significant group differences on demographic variables, M-CHAT and ADI-R scores, as well as other outcome variables at baseline level.

We used Linear Mixed Models (LMM) to model the longitudinal trajectories of the outcomes while accounting for subject-level variance. We explored the main effects of treatment (self-directed and web + group therapy), time (baseline (0), post-intervention (3), and 1-month follow-up (4)), and treatment by time interactions, and random intercepts were included to account for repeated-measure correlation. Missing values are treated as valid data in the mixed linear models, and statistics are based on all subject cases with valid data for all variables in the model.

4.3 Results

Figure 4.1 outlines the design of the randomized trial and shows participants flow through each phase of the study. A total of 8/37 (21.62%) participants (6 from self-directed and 2 from web + group therapy) were lost from follow-up.

4.3.1 Baseline Differences

The randomization procedure created baseline equivalency between treatment conditions. Baseline demographic characteristics are shown in Table 4.1, no significant group difference was identified in child's age, gender, verbal status, M-CHAT, ADI-R, family structure, family income, location, mother's education, and mother's employment.

Shaprio–Wilkes tests indicated data were normally distributed, independent t-tests were conducted to compare baseline clinical measures (Table 4.2 & Table 4.3). There were no

significant group differences in baseline clinical measures in both child and parent at baseline, as *p* values for baseline measures ranged from .06 to 1 (Table 4.2 & Table 4.3).

4.3.2 Linear Mixed Models Outcomes

Linear Mixed Models were conducted to estimate the treatment effect across time to model the longitudinal trajectories of the outcomes while accounting for subject-level variance. Random effects are assumed to vary across participants, while fixed effects are assumed to be constant across groups or time. Table 4.4 presents descriptive characteristics of child outcome measures by groups across three timepoints and Linear Mixed Models fixed effects results. Table 4.5 shows descriptive characteristics of parent outcome measures by groups across three timepoints and Linear Mixed Models fixed effects results.

4.3.2.1 ***Difference Between Groups***

Although both groups showed improvements or decreases in children's or parents' outcomes during the intervention period, there was no significant group difference in the outcome variables between the self-directed and the web + group therapy conditions. Marginally significant group differences were observed in children's *Externalizing Behaviors*, F (1, 61.74) = 3.47, p = 0.067 (Table 4.4), and in parents' *Difficult Child* in Parenting Stress Index, F (1, 45.40) = 3.15, p = 0.083 (Table 4.5).

4.3.2.2 ***Change Across Time***

Significant fixed effects of time were detected on children's outcomes (Table 4.4): (1) *VABS Communication*, F (1, 60.27) = 29.86, $p < 0.001$, (2) *VABS Socialization*, F (1, 60.07) = 11.73, p = 0.001, (3) *VABS Adaptive Behavior Composite*, F (1, 59.54) = 12.91, p = 0.001, (4) *Peds-QoL Total scores*, F (1, 59.95) = 17.99, $p < 0.001$, (5) *Peds-QoL Physical Health Summary*

Score, *F* (1, 60.93) = 9.77, *p* = 0.003, (6) *Peds-QoL Psychosocial Health Summary Score*, *F* (1, 60.24) = 14.73, *p* < 0.001.

There were significant fixed effects of time on the parents' outcomes (Table 4.5): (1) *GAD-7*, *F* (1, 57.62) = 11.36, *p* = 0.001, (2) *QoL Total scores*, *F* (1, 59.46) = 6.12, *p* = 0.016, (3) *QoL Physical health*, *F* (1, 59.65) = 5.448, *p* = 0.023, (4) *QoL Social relationships*, *F* (1, 63.43) = 4.64, *p* = 0.035, (5) *PSI Total Stress score*, *F* (1, 59.07) = 8.76, *p* = 0.004, (6) *PSI Parental Distress*, *F* (1, 59.96) = 6.04, *p* = 0.017, (7) *PSI Parent-Child Dysfunctional Interaction*, *F* (1, 59.64) = 5.2, *p* = 0.026, (8) *PSI Difficult Child*, *F* (1, 59.19) = 5.27, *p* = 0.025, (9) *PSDQ Authoritative style*, *F* (1, 63.20) = 12.9, *p* = 0.001.

4.3.2.3 *Interaction Effect*

There were significant group by time interaction effect on children's outcomes in terms of *Peds QoL Total Scores*, *F* (1, 59.95) = 5.90, *p* = 0.018, and *Peds QoL Psychosocial Health Summary Score*, *F* (1, 60.24) = 6.12, *p* = 0.016, and on parents' mental health outcome in *GAD-7*, *F* (1, 57.62) = 4.84, *p* =0.032. A marginally significant interaction effect was observed in parents' *Physical Health* domain in QoL, *F* (1, 59.65) = 3.84, *p* = 0.055 (Table 4.4 & Table 4.5),

4.3.2.4 *Outcome Estimate Statistics*

Adaptive Functioning: VABS

Significant fixed time effects without significant interaction effects were found on Communication, Socialization, and Adaptive Behavior Composite. Table 4.6 shows the estimate statistics for Communication, Socialization, and Adaptive Behavior Composite. Specifically, the communication standard scores showed significantly positive changes across time in self-directed group, *b* = 1.40, *t* (60.83) = 2.96, *p* = 0.006, and in the web + group therapy condition, *b*

= 2.14, t (59.48) = 5.04, $p < 0.001$. As a child spent 1 month in the telehealth intervention (time), the communication increased by 1.4 of a unit in the self-directed condition and by 2.14 of a unit in the web + group therapy condition, suggesting the time spent in the intervention (time) positively predicts communication. The socialization standard scores only demonstrated significant positive change in treatment group across time, $b = 1.34$, t (58.93) = 3.39, $p = 0.001$. The significant coefficient indicates that one unit change in *Time* (1 month) in the treatment condition, the socialization increased by 1.34 of a unit, suggesting the time spent in the treatment condition positively predicts socialization. The positive change in adaptive behavior composite across time showed marginally significant in self-directed group, $b = 0.52$, t (60.11) = 1.94, p = 0.057, and was significant in the web + group therapy condition, b=0.75, t (58.80) = 3.24, p = 0.002. The significant coefficient indicates that one unit change in *Time* (1 month) in the treatment condition, the adaptive behavior composite score increased by 0.75 of a unit, suggesting the time spent in the treatment condition (time) positively predicts overall adaptive skills.

Child Quality of Life: Peds-QoL

Children in both groups and their parents did not differ significantly in how they rated their children's QoL. However, the change in mean scores of all three Peds-QoL summary scores across time were significant. A significant interaction effect was found in parents' report of their children's QoL in Total Score and Psychosocial Health Summary Score (Table 4.7). Specifically, parents in the treatment group reported a significantly positive change in their ratings of children's QoL over the intervention period, including Total Scores, $b = 2.87$, t (58.66) = 5.04, p < 0.001, Physical Health Summary Score, $b = 2.36$, t (58.79) = 3.16, $p = 0.002$, and Psychosocial Health Summary Score, $b = 3.14$, t (58.92) = 4.76, $p < 0.001$. The significant coefficients for

subscales mentioned in the treatment group indicate that such increased in time positively predicts parents' report of their children's QoL. The change in the ratings of children's QoL was not significantly reported from parents in the self-directed condition across time. The group × time effect was significant in Total Scores, b = -2.09, t (59.95) = - 2.43, p = 0.018, and Psychosocial Health Summary Score, b = -2.46, t (60.24) = - 2.47, p = 0.016. The negative coefficients indicate that the change in self-direct condition was significantly lower than the treatment group by 2.09 of a unit in Total Score, and by 2.46 of a unit in Psychosocial Health Summary Score. Figure 4.2 shows the mean scores of Peds QoL Total Score and Psychosocial Health Summary Score for the self-directed and the web + group therapy from baseline to the end of follow-up phase. The interaction effect indicates that time effect was greater in the web + group therapy condition than the self-directed condition.

Parents' Mental Health: GAD-7

A significant time effect and a significant group by time interaction effect were found on GAD-7. Table 4.8 shows the estimate statistics for time effect and group by time interaction effect. Parents in the treatment group reported a significantly negative relationship between the mean of GAD-7 and time, b = - 0.79, t (55.73) = - 4.24, $p < 0.001$, while the decrease in the comparison group was not significant, b = -0.17, t (59.07) = - 0.78, p = 0.44. The significant coefficients in the treatment group indicate that 1 unit change in Time was associated with 0.79 unit decrease in anxiety, suggesting the time spent in the treatment condition (time) negatively predicts anxiety outcome in parents. The group × time effect was significant, b = 0.63, t (57.62) = -2.43, p = 0.032. Figure 4.3 shows the mean GAD-7 scores by groups across the intervention period. The significant group by time interaction effect indicates the reduction in GAD-7 over time was larger in the web + group therapy condition than the self-directed condition.

Parents' Quality of Life: WHOQOL-BREF

Analyses revealed significant fixed effect of time without significant interaction effects for Physical Health, Social Relationships, and Total Score in WHOQOL-BREF. Parents in both conditions showed improvement in Total QoL score, especially in Physical Health and Social Relationships domains (Table 4.9).

Parenting Stress: Parenting Stress Index - Short Form

Parent stress level was measured by the PSI-SF. A significant fixed effect of time without a significant interaction effect was found on all subscales in PSI, including Parental Distress, Difficult Child, Parent-Child Dysfunctional Interaction, and Total Stress Score. Table 4.10 shows the estimate statistics in four subscales. Parents in both conditions demonstrated decrease in all parenting stress variables across the intervention period. Specifically, the total stress score demonstrated significantly decrease across time in self-directed group, b = -2.13, t (60.45) = -2.17, p = 0.034, and in the web + group therapy condition, b = -1.72, t (57.28) = -2.01, p = 0.049. The significant coefficients indicate that 1 unit change in *Time* was associated with 2.13 unit decrease in parenting stress for parents in the self-directed condition, and with 2.01 unit decrease for parents in the web + group therapy condition. The results suggest the *Time* negatively predicts total stress score.

Parenting Style: Parenting Styles and Dimensions Questionnaire

Parenting style was measured by PSDQ. The z-score of three parenting styles were yielded. A significant time effect without a significant interaction effect was found on the authoritative parenting style, as parents in both conditions demonstrated increased average scores in authoritative parenting style across the intervention period. Specifically, a significate positive relationship between the authoritative parenting style and time was detected in treatment group, b

= 0.08, t (60.42) = 3.56, p = 0.001. The significant coefficients in the treatment group indicate that 1 unit change in *Time* was associated with 0.08 unit increase in the use of authoritative parenting behaviors (Table 4.11).

4.4 Discussion

This study is among the first few studies using a randomized controlled design. the treatment effect was determined by comparing two formats of telehealth service across intervention period. The present study used a culturally adapted parent coaching intervention which was delivered via telehealth and tailored to the Chinese context. The primary purpose of this randomized controlled trial was to explore the effectiveness by groups across time on both children's and parents' outcomes. Results of the RCT indicate that either condition in this culturally adapted parent coaching intervention effectively improved children's communication skills and social engagement and alleviated the parenting stress and anxiety level of parents of children with autism. Moreover, the telehealth intervention effectively improved the quality of life in both children and parents. Specifically, the group-based parent coaching via videoconferencing showed greater improvement in children's quality of life and parent's anxiety outcome.

Both intervention groups showed improvements in most children's outcomes over time. Significant improvement was observed in children's communication, socialization and overall adaptive functioning and quality of life. Specifically, the Adaptive Behavior Composite score is based on scores for three specific adaptive behavior domains: Communication, Daily Living Skills, and Socialization. The cut-off scores below 70 indicate low levels of adaptive behavior. As Table 4 presents, children in both groups were on the edge of 70 at baseline and showed significant improvement after the intervention. Children's quality of life was reported by parent,

parents in the treatment group perceived greater improvement in their children's quality of life. These results demonstrates that change can be made in core developmental domains for children with autism with a well-structured, skill-focused, group-based telehealth intervention. These data contribute to the literature on group-based parent training with young children with autism that has reported mixed or minimal results on children's outcomes (O'Donovan et al., 2019). Group difference was not found in most child outcomes in our study, the possible reasons could be that parents in two conditions followed the same modules and the dosage of 1.5 hours weekly group sessions could not differentiate the efficacy of two telehealth service format. Another possible reason is that more than half of parents in the self-directed condition received individualized feedback during the intervention due to the homework submission. Future study should follow up with different dosages of assistance in telehealth studies to differentiate the efficacy of various telehealth service formats, such as self-directed only verse self-directed with feedback.

Parents' outcomes improved significantly in both groups over time, including reduction in the parenting stress and anxiety level and increase in parents' quality of life. GAD-7 was used to measure parents' anxiety level, with a cutoff above 5 indicating mild anxiety. The mean scores of GAD-7 in both groups exceeded the mild threshold at baseline and was decreased significantly below the cutoff after the intervention. Specifically, the group-based parent coaching via videoconferencing showed greater reduction in parent's anxiety outcome over time. However, there was a mild increase in GAD-7 in the treatment group at follow-up assessment, which may result from the end of the group therapy.

Same pattern was observed in the mean scores for the Total Stress Score on PSI-SF. Parents who receive a PSI-SF Total Stress score of 90 or higher are considered to be experiencing clinically significant parenting stress (Abidin, 2012; Abidin & Abidin, 1990). Both

groups demonstrated high levels of parenting stress at baseline, but the treatment group's mean Total Stress Score dropped to around 90 after the intervention. Similarly, there followed a climb in the treatment group during the follow-up phase, while the self-directed condition kept dropping. This pattern is largely due to the end of the group-based coaching session, when parents in the treatment group may not know how to proceed once the assistance of the therapist stopped. Strategies to better keep families sustained after the intervention should be considered in the future studies. In addition, further investigation is required on better understanding the relationships between the parenting stress, parental anxiety, and children's behavior problems, and its impact on the quality of life in both parents and their children with autism.

Evidence-bases intervention in low and middle-income countries was severely limited due to a lack of resources and trained professionals. Parent-mediated interventions could be one focus for autism care in lower-resource settings (Blake et al., 2017; Lee & Meadan, 2021; Liu et al., 2020; Parsons et al., 2017). Research has shown the great effectiveness of PMIs in both in-person clinical settings (Abouzeid et al., 2020; Liu et al., 2020; Nevill et al., 2018; Oono et al., 2013) or in telehealth formats (Hao et al., 2021; Jurek et al., 2021; Parsons et al., 2017). Parsons et al. (2017) systematically reviewed parent training programs which were delivered remotely for children with autism living outside urban areas. Preliminary evidence suggested that remotely delivered parent-mediated intervention training may improve caregiver expertise and enhance intervention fidelity. However, only 1 program out of seven included studies conducted randomized controlled trials (Ingersoll & Berger, 2015; Ingersoll et al., 2016). It is essential to develop more culturally appropriateness materials or interventions and test its efficacy by a rigorous RCT design. The development of culturally appropriate PMI could create a

collaborative and supportive relationship between caregivers and professionals, which might address the limited access to autism service for families in low-resource settings.

Group-based parent training has received less attention due to a lack of theories to guide intervention development, evaluation and implementation (Farmer & Reupert, 2013; Kowalkowski, 2012; Lodder et al., 2020; Lunsky et al., 2021; O'Donovan et al., 2019; Todd et al., 2010). Meanwhile, virtual parent training has the potential to help with service access in areas where autism services are scarce (Lindgren et al., 2016; Parsons et al., 2017). This study was among a few studies using videoconferencing to deliver small group parent coaching intervention and was tested in a RCT design. The intervention was adapted and developed based on P-ESDM (Chapter2). The preliminary findings of this RCT indicates that the successful adaptation and strategies used to actively engage parents in the group-based coach. In addition, it adds to the evidence of group-based parent training via videoconferencing.

4.4.1 Strengths and Limitations

The current study demonstrated the preliminary findings of a culturally adapted group-based parent coaching intervention with two conditions, the self-directed and the web + group therapy. Strengths of this study are the use of random allocation and standardized clinical measures. Especially, the treatment group demonstrated high attendance (92%), high completion rate (90%), and low drop-out rate (10.5%), which suggest that delivering small-group parent coaching via videoconferencing is feasible and have great potential to support families at the early stage of processing the ASD diagnosis.

One limitation is that the intervention completion rate in the self-directed condition was relatively lower than the treatment group (50% verse 90%). Reasons are unclear but suggesting the low dosage of group coaching was critical and could be a factor that effectively promotes the

parental engagement in the study. Another limitation is that children in both conditions received an active treatment; therefore, maturation cannot be easily separated from intervention effects. However, when these results are comparing to studies that report longitudinal trajectories for toddlers with autism, it appears that the expected developmental trajectory is a worsening of standard scores (Landa & Garrett-Mayer, 2006; Lord, Luyster, et al., 2012; Ozonoff et al., 2008; Ozonoff et al., 2010; Varcin & Jeste, 2017). Our findings contribute to current literature by demonstrating the preliminary effectiveness of a 12-week culturally adapted parent coaching intervention, which led to a positive developmental trajectory in children with autism and positive promotion to mental well-being in parents.

4.4.2 Conclusion

The present study conducted a pilot RCT to determine the effectiveness of a culturally adapted telehealth intervention on both children's and parents' outcomes. The effectiveness of this intervention was tested by linear mixed models with fixed effects in groups, time, and group by time interaction effect. The preliminary findings show this telehealth intervention has showed great potential for improving the quality of life and enhancing mental and well-being of both parents and their children with autism. Children in both intervention conditions showed increase in communication skills, social engagement, and quality of life. Parents in either condition had decrease in parenting stress and anxiety, as well as increase in the use of authoritative parenting behaviors. Furthermore, the findings support the effectiveness of the group-based parent coaching compared to the self-directed condition on the child and parent outcomes, suggesting the group coaching via videoconferencing could be a promising home-based service model to decrease parents' anxiety.

Table 4.1 Participants Demographics at Baseline

Characteristic	Self-directed (N=18)	Web + Group therapy (N=19)
Child Age (years),		
Mean±SD	3.17 ± 0.70	3.25 ± 0.95
Range	1.68 - 4.62	1.70 - 5.16
Child Sex, N (%)		
Males	16 (88.89)	16 (84.21)
Females	2 (11.11)	3 (15.79)
M-CHAT		
Mean±SD	9.39 ± 3.05	7.21 ± 3.82
ADI-R, Mean±SD		
Social impairment	20.61 ± 3.57	19.16 ± 4.25
Communication	10.94 ± 2.01	9.42 ± 2.81
Repetitive interest	3.78 ± 1.73	3.32 ± 1.97
Total	38.72 ± 6.33	35.26 ± 7.70
Participating Parent, N (%)		
Mother	17 (94.44)	15 (78.95)
Adoptive Mother	0 (0.00)	1 (5.26)
Father	1 (5.56)	3 (15.79)
Family structure, N (%)		
Nuclear Family	6 (33.33)	4 (21.05)
Three Generations Family	10 (55.56)	14 (73.68)
Single Parent Family	1 (5.56)	0 (0.00)
Others	1 (5.56)	1 (5.26)
Monthly Family Income, N (%)		
<460 Dollars	4 (22.22)	1 (5.26)
460-770 Dollars	0 (0.00)	3 (15.79)
770-1540 Dollars	4 (22.22)	4 (21.05)
1540-3080 Dollars	6 (33.33)	7 (36.84)
3080-7690 Dollars	4 (22.22)	4 (21.05)
Location, N (%)		
Urban	15 (83.33)	16 (84.21)
Rural	3 (16.67)	3 (15.79)
Mother's Education, N (%)		
High school or below	2 (11.11)	2 (10.53)
Junior college	6 (33.33)	6 (31.58)
Undergraduate	7 (38.89)	8 (42.11)
Graduate or above	3 (16.67)	3 (15.79)
Mother's Employment, N (%)		
Full-time	6 (33.33)	10 (52.63)
Part-time	0 (0.00)	1 (5.26)
Unemployed	11 (61.11)	7 (36.84)
Self-employed	1 (5.56)	1 (5.26)

Table 4.2 Children Baseline Outcomes

	Self-directed Web (n = 18)	Web + group therapy (n = 19)	*p*
	M (SD)	*M (SD)*	
VABS			
Communication	69.44 (15.02)	64.32 (17.97)	0.35
Daily Living	77.89 (9.68)	81.37 (14.00)	0.39
Socialization	64.78 (9.93)	61.95 (13.12)	0.47
Motor	88.00 (13.48)	92.47 (12.31)	0.30
Adaptive Behavior Composite	70.44 (7.19)	69.53 (9.69)	0.75
CBCL			
Internalizing	10.83 (3.79)	9.42 (3.20)	0.23
Externalizing	9.83 (3.62)	7.74 (2.77)	0.06
Total problems	34.83 (8.46)	30.26 (7.61)	0.09
Peds-QoL			
Total Score	61.04 (16.13)	59.38 (15.70)	0.75
Physical Health Summary Score	69.97 (16.51)	69.74 (14.88)	0.96
Psychosocial Health Summary Score	54.11 (18.45)	52.01 (18.06)	0.73

Note. M, mean; SD, standard deviation; VABS, Vineland Adaptive Behavior Scales; CBCL, Child Behavior Checklist; Peds-QoL, Pediatric Quality of Life Inventory

Table 4.3 Parent Baseline Outcomes

	Self-directed Web (n = 18)	Web + group therapy (n = 19)	
	M (SD)	*M (SD)*	*p*
GAD-7	6.17 (5.46)	6.16 (5.38)	1
PHQ-9	7.39 (6.50)	6.58 (5.34)	0.68
QoL			
Physical health	0.59 (0.14)	0.66 (0.13)	0.13
Psychological	0.51 (0.19)	0.50 (0.17)	0.85
Social relationships	0.51 (0.13)	0.57 (0.15)	0.20
Environment	0.54 (0.18)	0.53 (0.15)	0.90
Total Score	81.83 (15.18)	84.53 (13.41)	0.57
PSI			
Parental Distress	36.89 (7.95)	37.42 (11.57)	0.87
Parent-Child Dysfunction Interaction	32.44 (8.99)	30.00 (7.89)	0.38
Difficult Child	35.50 (8.10)	30.95 (7.67)	0.09
Total Stress Score	104.83 (22.13)	98.37 (22.67)	0.39
PSDQ			
Authoritative	3.62 (0.40)	3.44 (0.50)	0.23
Authoritarian	2.27 (0.43)	2.29 (0.49)	0.91
Permissive	2.56 (0.43)	2.60 (0.68)	0.81

Note. M, mean; SD, standard deviation; GAD-7, Generalized Anxiety Disorder-7; PHQ-9, Patient Health Questionnaire-9; QoL, WHO Quality of Life Scale; PSI, Parenting Stress Index-4, Short Form; PSDQ, Parenting Styles and Dimensions Questionnaire

Table 4.4 Child Outcome Measures and Linear Mixed Model Results

	Self-directed Web						Web + Group therapy						Fixed Effect					
	Baseline (T1)		Post intervention (T2)		Follow-up (T3)		Baseline (T1)		Post intervention (T2)		Follow-up (T3)		Group		Time		Group × Time	
	n	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	F	*p*	F	*p*	F	*p*
VABS																		
Communication	18	69.44 (15.02)	14	77.21 (13.25)	12	75.75 (12.74)	19	64.32 (17.97)	18	73.11 (18.06)	17	72.06 (16.60)	0.87	0.358	29.86	0.000	1.30	0.258
Daily Living	18	77.89 (9.68)	14	78.29 (8.06)	12	78.08 (9.46)	19	81.37 (14.00)	18	80.72 (12.75)	17	78.29 (11.36)	0.93	0.340	0.89	0.349	0.42	0.517
Socialization	18	64.78 (9.93)	14	69.79 (13.62)	12	65.33 (10.06)	19	61.95 (13.12)	17	64.24 (11.91)	17	66.71 (12.71)	0.68	0.416	11.73	0.001	1.06	0.308
Motor	18	88.00 (13.48)	14	90.79 (13.20)	12	89.25 (13.90)	19	92.47 (12.31)	17	92.82 (12.09)	17	92.47 (15.58)	0.88	0.355	0.59	0.447	0.36	0.552
Adaptive Behavior Composite	18	70.44 (7.19)	14	73.93 (7.99)	12	72.25 (6.97)	19	69.53 (9.69)	17	72.18 (10.61)	17	71.76 (9.74)	0.09	0.763	12.91	0.001	0.44	0.509
CBCL																		
Internalizing	18	10.83 (3.79)	14	11.79 (4.32)	12	10.17 (3.93)	19	9.42 (3.20)	18	9.44 (4.12)	16	8.75 (3.44)	1.41	0.240	0.55	0.463	0.51	0.476
Externalizing	18	9.83 (3.62)	14	10.21 (4.00)	12	10.75 (3.41)	19	7.74 (2.77)	18	8.17 (3.17)	16	8.19 (3.10)	3.47	0.067	0.61	0.438	0.03	0.857
Total problems	18	34.83 (8.46)	14	35.43 (12.96)	12	35.67 (9.78)	19	30.26 (7.61)	18	29.83 (9.38)	16	28.31 (9.29)	1.93	0.171	0.43	0.516	0.92	0.342
Peds-QoL																		
Total Score	18	61.04 (16.13)	14	64.27 (14.51)	12	64.43 (15.73)	19	59.38 (15.70)	18	67.03 (14.99)	16	68.24 (15.78)	0.11	0.747	17.99	0.000	5.90	0.018
Physical Health Summary Score	18	69.97 (16.51)	14	74.78 (13.28)	12	75.78 (16.60)	19	69.74 (14.88)	18	76.74 (14.67)	16	76.95 (15.47)	0.00	0.967	9.77	0.003	1.18	0.282
Psychosocial Health Summary Score	18	54.11 (18.45)	14	56.40 (16.59)	12	55.88 (17.71)	19	52.01 (18.06)	18	59.99 (17.68)	16	61.97 (17.79)	0.13	0.718	14.73	0.000	6.12	0.016

Note. M, mean; SD, standard deviation; VABS, Vineland Adaptive Behavior Scales; CBCL, Child Behavior Checklist; Peds-QoL, Pediatric Quality of Life Inventory

Table 4.5 Parent Outcome Measures and Linear Mixed Model Results

	Self-directed Web			Web + group therapy			Fixed Effect					
	T1 (n = 18)	T2 (n = 13)	T3 (n = 12)	T1 (n = 19)	T2 (n = 18)	T3 (n = 16)	Group		Time		Group × Time	
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	F	*p*	F	*p*	F	*p*
GAD-7	6.17 (5.46)	4.69 (4.64)	4.67 (2.74)	6.16 (5.38)	3.50 (4.19)	3.81 (3.92)	0.00	0.961	11.36	0.001	4.84	0.032
PHQ-9	7.39 (6.50)	6.46 (6.21)	6.25 (4.75)	6.58 (5.34)	4.50 (5.44)	5.63 (4.81)	0.24	0.624	1.12	0.295	1.81	0.184
QoL												
Physical health	0.59 (0.14)	0.68 (0.13)	0.69 (0.17)	0.66 (0.13)	0.67 (0.14)	0.64 (0.18)	2.16	0.149	5.45	0.023	3.84	0.055
Psychological	0.51 (0.19)	0.55 (0.16)	0.58 (0.20)	0.50 (0.17)	0.59 (0.22)	0.51 (0.19)	0.00	0.997	2.94	0.092	0.20	0.658
Social relationships	0.51 (0.13)	0.58 (0.16)	0.59 (0.18)	0.57 (0.15)	0.64 (0.18)	0.58 (0.17)	1.62	0.208	4.64	0.035	0.24	0.626
Environment	0.54 (0.18)	0.57 (0.17)	0.59 (0.18)	0.53 (0.15)	0.59 (0.23)	0.57 (0.16)	0.01	0.946	3.16	0.081	1.60	0.211
Total	81.83 (15.18)	87.92 (15.01)	89.83 (16.99)	84.53 (13.41)	90.11 (17.87)	85.75 (15.75)	0.38	0.542	6.12	0.016	0.00	0.949
PSI												
Parental Distress	36.89 (7.95)	35.85 (9.49)	33.17 (9.30)	37.42 (11.57)	33.17 (10.87)	35.50 (9.35)	0.00	0.960	6.04	0.017	0.69	0.409
PCDI	32.44 (8.99)	29.31 (7.09)	29.25 (8.09)	30.00 (7.89)	27.56 (7.49)	31.13 (7.66)	1.05	0.312	5.20	0.026	0.72	0.401
Difficult Child	35.50 (8.10)	30.62 (8.46)	32.42 (9.29)	30.95 (7.67)	29.50 (5.55)	31.81 (6.01)	3.15	0.083	5.27	0.025	1.25	0.268
Total Stress Score	104.83 (22.13)	95.77 (23.71)	94.83 (24.79)	98.37 (22.67)	90.22 (19.15)	98.44 (19.04)	0.91	0.345	8.76	0.004	0.10	0.753
PSDQ												
Authoritative	3.62 (0.40)	3.74 (0.57)	3.80 (0.46)	3.44 (0.50)	3.78 (0.33)	3.66 (0.33)	1.32	0.256	12.90	0.001	1.25	0.268
Authoritarian	2.27 (0.43)	2.14 (0.39)	2.10 (0.33)	2.29 (0.49)	2.27 (0.60)	2.38 (0.55)	0.01	0.943	0.57	0.454	1.07	0.305
Permissive	2.56 (0.43)	2.22 (0.73)	2.40 (0.56)	2.60 (0.68)	2.51 (0.75)	2.68 (0.57)	0.07	0.787	1.55	0.217	1.04	0.312

Note. M, mean; SD, standard deviation; GAD-7, Generalized Anxiety Disorder-7; PHQ-9, Patient Health Questionnaire-9; QoL, WHO Quality of Life Scale; PSI, Parenting Stress Index-4, Short Form; PCDI, Parent-Child Dysfunctional Interaction; PSDQ, Parenting Styles and Dimensions Questionnaire

Table 4.6 Estimate Statistics of Fixed Time Effects in Vineland Adaptive Behavior Scales

Fixed effects	Estimate (95% CI)	*SE*	*t*	*p*
Communication				
Time				
Self-directed	1.40 (0.42 - 2.37)	0.49	2.86	0.006
Web + Group therapy	2.14 (1.29 - 2.98)	0.42	5.04	0.000
Socialization				
Time				
Self-directed	0.72 (-0.19 - 1.63)	0.45	1.59	0.117
Web + Group therapy	1.34 (0.55 - 2.14)	0.40	3.39	0.001
Adaptive Behavior Composite				
Time				
Self-directed	0.52 (-0.02 - 1.05)	0.27	1.94	0.057
Web + Group therapy	0.75 (0.29 - 1.22)	0.23	3.24	0.002

Table 4.7 Estimate Statistics of Fixed Effects in Pediatric Quality of Life Inventory

Fixed effects	Estimate (95% CI)	*SE*	*t*	*p*
Total score				
Time				
Self-directed	0.78 (-0.51 - 2.07)	0.64	1.21	0.231
Web + Group therapy	2.87 (1.73 - 4.01)	0.57	5.04	0.000
Group×Time	-2.09 (-3.812 to -0.369)	0.86	-2.43	0.018
Physical Health Summary Score				
Time				
Self-directed	1.14 (-0.53 - 2.81)	0.84	1.37	0.177
Web + Group therapy	2.36 (0.87 - 3.85)	0.75	3.16	0.002
Group×Time	-	-	-	-
Psychosocial Health Summary Score				
Time				
Self-directed	0.68 (-0.81 - 2.17)	0.75	0.91	0.366
Web + Group therapy	3.14 (1.82 - 4.46)	0.66	4.76	0.000
Group×Time	-2.46 (-4.46 to -0.47)	1.00	-2.47	0.016

Table 4.8 Estimate Statistics of Fixed Effects in Generalized Anxiety Disorder-7

Fixed effects	Estimate (95% CI)	*SE*	t	*p*
Time				
Self-directed	-0.17 (-0.60 - 0.26)	0.21	-0.78	0.44
Web + Group therapy	-0.79 (-1.17 to -0.42)	0.19	-4.24	0.00
Group×Time	0.63 (0.06 - 1.19)	0.28	2.20	0.03

Table 4.9 Estimate Statistics of Fixed Time Effects in WHOQOL-BREF

Fixed effects	Estimate (95% CI)	*SE*	t	*p*
Physical health				
Time				
Self-directed	0.02 (0.01 - 0.03)	0.01	2.85	0.006
Web + Group therapy	0.00 (-0.01 - 0.01)	0.01	0.29	0.776
Social relationships				
Time				
Self-directed	0.02 (0.00 - 0.04)	0.01	1.77	0.081
Web + Group therapy	0.01 (-0.01 - 0.03)	0.01	1.25	0.216
Total score				
Time				
Self-directed	1.15 (-0.29 - 2.58)	0.72	1.60	0.115
Web + Group therapy	1.21 (-0.04 - 2.46)	0.63	1.93	0.058

Note. WHOQOL-BREF, WHO Quality of Life Scale-Brief

Table 4.10 Estimate Statistics of Fixed Time Effects in Parenting Stress Index

Fixed effects	Estimate (95% CI)	*SE*	t	*p*
Parental Distress				
Time				
Self-directed	-0.50 (-1.44 - 0.43)	0.47	-1.08	0.285
Web + Group therapy	-1.02 (-1.83 to -0.20)	0.41	-2.50	0.015
Parent-Child Dysfunctional Interaction				
Time				
Self-directed	-0.80 (-1.58 to -0.03)	0.39	-2.07	0.042
Web + Group therapy	-0.37 (-1.04 - 0.31)	0.34	-1.09	0.280
Difficult Child				
Time				
Self-directed	-0.85 (-1.60 to -0.10)	0.37	-2.27	0.027
Web + Group therapy	-0.29 (-0.95 - 0.36)	0.33	-0.90	0.374
Total Stress score				
Time				
Self-directed	-2.13 (-4.09 to -0.17)	0.98	-2.17	0.034
Web + Group therapy	-1.72 (-3.43 to -0.01)	0.85	-2.01	0.049

Table 4.11 Estimate Statistics of Fixed Time Effects in Authoritative Parenting Style

Fixed effects	Estimate (95% CI)	*SE*	t	*p*
Time				
Self-directed	0.04 (-0.01 - 0.09)	0.02	1.65	0.104
Web + Group therapy	0.08 (0.03 - 0.12)	0.02	3.56	0.001

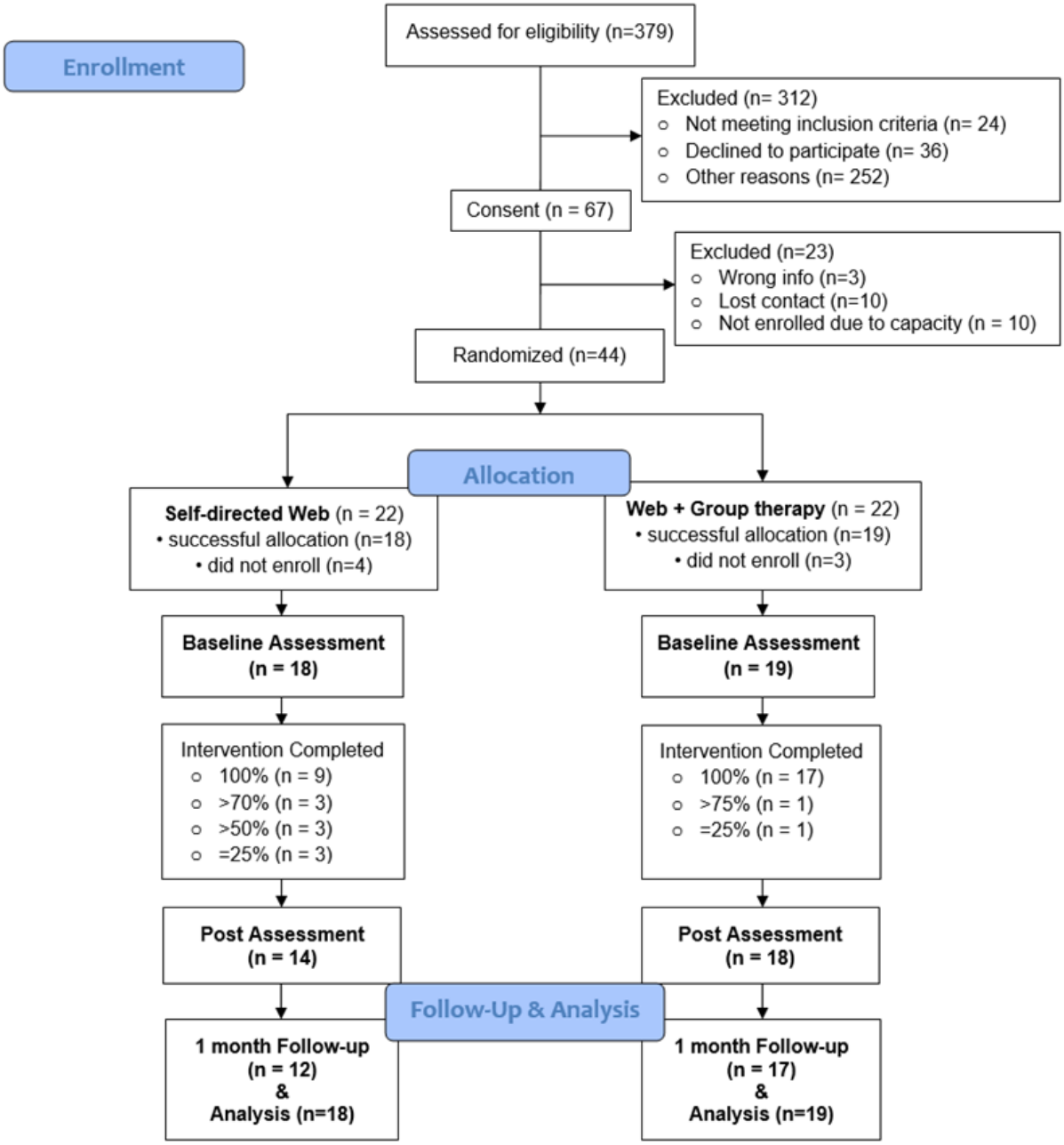

Figure 4.1 CONSORT Flow Diagram

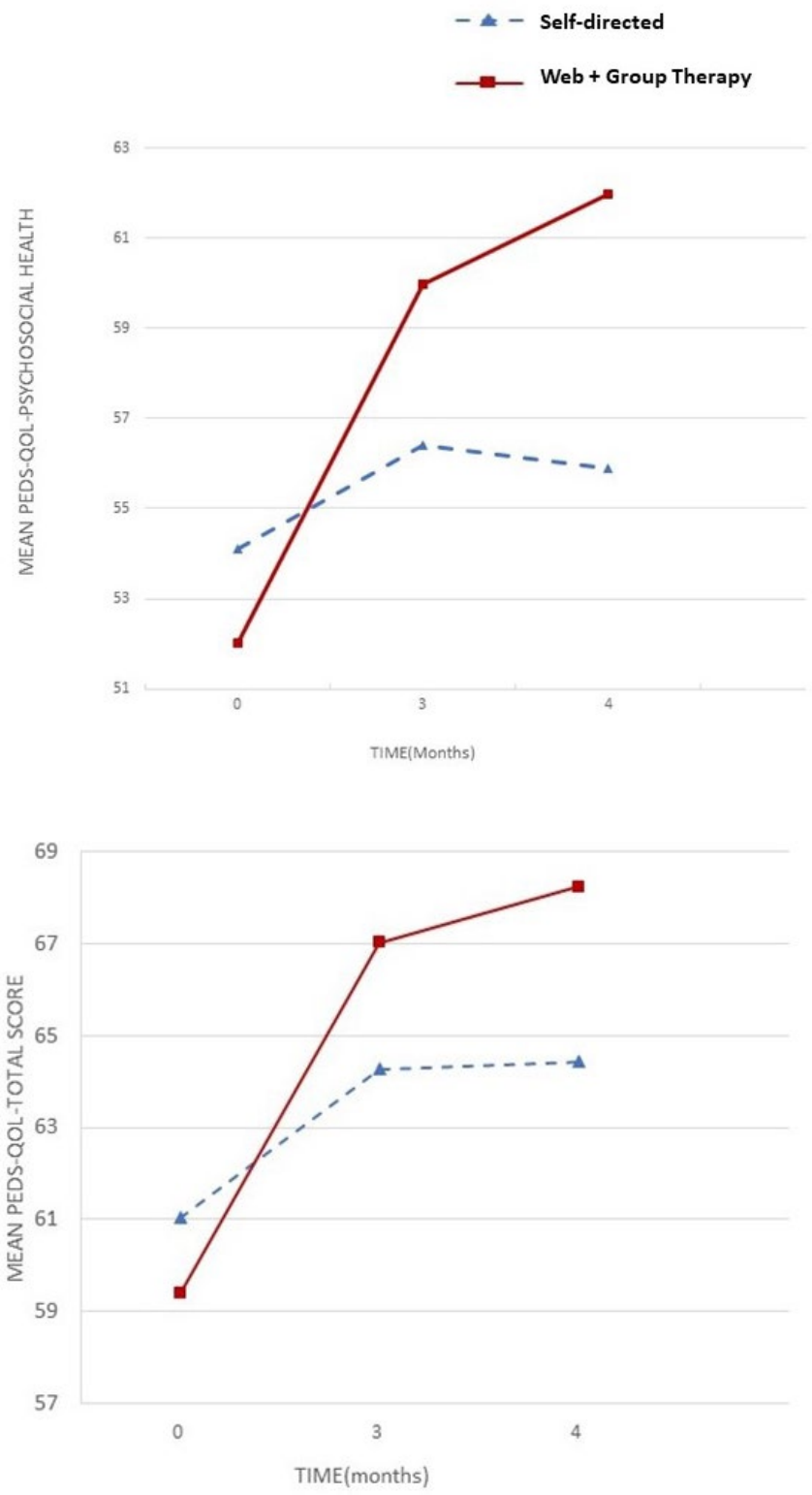

Figure 4.2 Mean of Peds-QoL by Groups over the Intervention Period

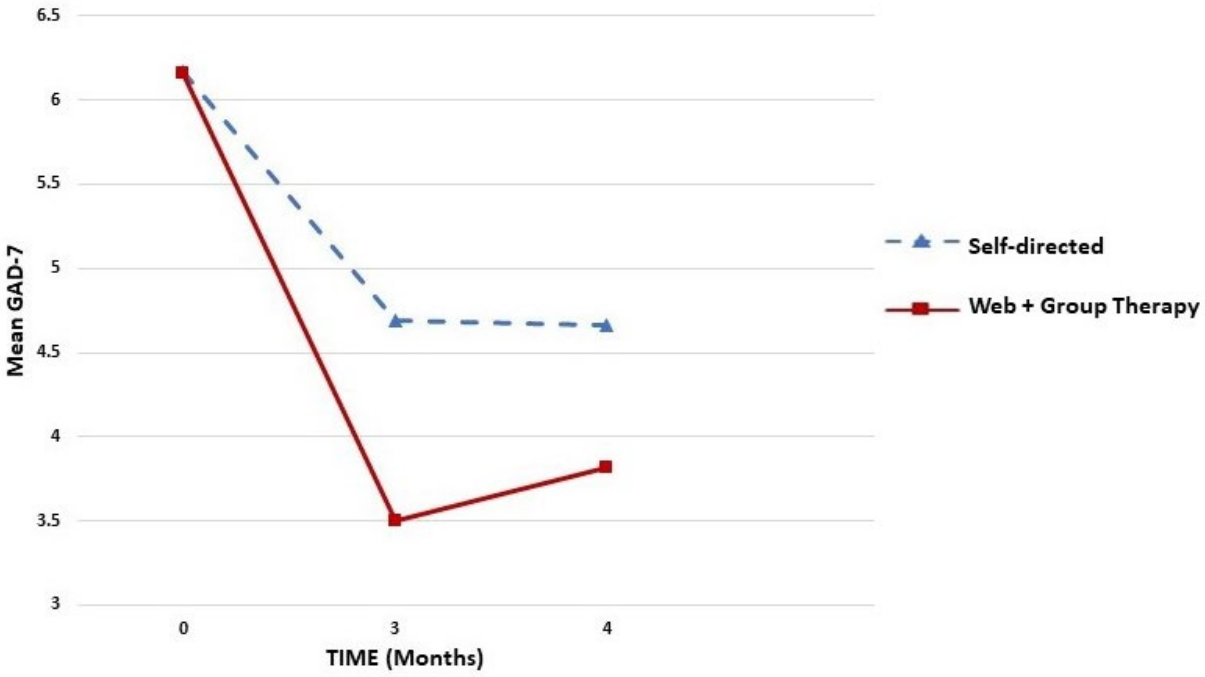

Figure 4.3 Mean of GAD-7 by Groups over the Intervention Period

Chapter 5 Conclusion

According to global estimates, Autism affects at least 78 million individuals around the world (Lord et al., 2022; Lord et al., 2018). Specifically, it was estimated that 4.57 million children under the age of five had autism spectrum disorder (ASD), and about 95% of these children lived in low-income and middle-income countries (LMIC) (Olusanya et al., 2018). The majority of children with autism and families lack access to healthcare, education, and social support. The situation is even worse for families in LMICs or low-resource settings.

Current autism treatment and intervention services include a wide range of approaches, such as behavioral, developmental, educational, psychological, and complementary and alternative approaches (Prevention, 2019). However, research to date has not yet determined the applicability and translational potential of existing treatments across cultures and socioeconomic statuses (Durkin et al., 2015; Lord et al., 2022). The lack of representation of these culturally, linguistically, and socioeconomically diverse communities in autism literature requires more research into effective treatments for children with autism and their families in LMIC, allowing the majority of the autism population to benefit from autism studies. As a result, intervention studies should aim to develop culturally appropriate and economically affordable treatments for children with autism and their families. More importantly, these treatments should consider local health resources to maintain high quality and be scalable and sustainable(Lord et al., 2022).

This dissertation focused on translating an evidence-based practice (EBP), the Parent-mediated Early Start Denver Model (P-ESDM), into a culturally appropriate telehealth intervention for families with a newly diagnosed child in mainland China. The study aimed to:

(1) culturally adapt P-ESDM using the Ecological Validity Model (EVM) and the family-centered capacity-building approach, (2) determine the feasibility of conducting a randomized controlled trial of this telehealth intervention in the Chinese context, (3) evaluate the intervention implementation by assessing parents' satisfaction, acceptability, appropriateness, and feasibility, and (4) explore the effectiveness of this telehealth intervention on both children's and parents' outcomes.

The dissertation adds to current literature in the following aspects. First, we developed a 12-week group-based parent coaching intervention which was delivered via telehealth and tailored to the Chinese context. This culturally adapted parent coaching intervention taught family caregivers how to integrate evidence-based intervention strategies into everyday routines and home activities. Scientific theories and clinical guidelines were adopted to guide intervention development, reporting, implementation, and evaluation. Second, in addition to facilitating child development, the dissertation also focused to reduce parenting stress, improve parental competence and self-efficacy through online group-based parent coaching. Third, the use of telehealth was presented in two service formats, a self-directed digital learning program (connect people to training) and a plus version with synchronous group-based parent coaching therapy (connect people to people). We conducted a randomized controlled feasibility trial to pave the way for definitive trials in the future. Pilot evaluation emphasized feasibility testing and exploratory effectiveness reporting. Furthermore, we used a mixed-methods approach to evaluate the intervention implementation from the Chinese parents' perspectives. Implementation outcomes, such as acceptability, appropriateness, feasibility, and satisfaction, were evaluated in the Chinese context.

There are several key findings in this dissertation study. First, it is possible to use the theoretical model (Ecological Validity Model) and the clinical guideline (the family-centered capacity-building approach) to culturally adapt an existing evidence-based practice. The adaptation process lasted for four months, extensive work time contributed to the creation of learning materials, such as lecture slides preparation, video recording, practice manuals development, website development. The intervention adaption and development lasted four months. The major goals of this preparation phase were tailoring the current EBP to the Chinese culture and translating the in-person practice into a digital intervention. A significant amount of work time was dedicated to the creation of learning materials such as lecture slides, video recording, practice manual development, and website building. In addition, we developed documents to ensure that the intervention study went successfully, such as digital recruitment poster, program workbook, video tutorials, and so on. One thing that we observed from this international digital intervention was that the eligibility screening scheduling took over one and half month due to the time difference between the U.S. and China. Future global research using technology across borders should consider rapid screening tests.

Second, it was feasible to conduct such a randomized control trial study in the Chinese context. Specifically, the digital recruitment showed great capacity with a recruitment rate of 33.5 families per week. At least 69% of all eligible patients could be recruited. All the families that consented to take part in the study agreed to be allocated to the treatment condition at random. High attendance (92%), high completion rate (90%), and low drop-out rate (10.5%) was observed in the web + group therapy condition. The results suggest that delivering small-group parent coaching via videoconferencing was likely to be feasible in the Chinese community. Moreover, over half of the participants volunteered to submit homework for the majority of

modules, which indicates that culturally appropriate treatment may be a factor contributing to high parental engagement. The pattern of parental participation on the program website suggested that clinicians should consider strategies at the later phase of the intervention to boost engagement, such as email and text reminders.

Third, this culturally adapted telehealth intervention was acceptable, appropriate, and feasible for Chinese parents. The mixed-methods findings provided a nuanced knowledge of the elements or characteristics that determined the program's implementation success. Parents in both conditions rated positively on the elements of program implementation. The program content, design, delivery, participation, and group therapy were five aspects that parents considered when evaluating the program acceptability. Particularly, tailored feedback, demonstration and commentary videos, peer commenting, live coaching, and guided reflection were the top five telehealth strategies that were strongly endorsed by the Chinese parents. Parents evaluated the program appropriateness based on whether it met parents' needs or addressed their problems. Intervention features, such as family-centered care, home-based intervention, strategies relative to daily activities, remote learning platform, and program-based community, were regarded as treatment appropriateness by parents. The parent modeling, step-by-step instructions, learning by doing, formative and tailored feedback, and peer learning were five practical elements that facilitated parents to implement the intervention at home. Parents in our program experienced different technology problems including the shortage of digital devices, slow Internet speeds, App crash and incompatibility, and stream latency. Barriers, such as long work hours and unexpected interruptions from life events, were reported by parents. Parents also suggestions for improving future iterations of this adapted program.

Lastly, this telehealth intervention effectively improved children's communication skills and social engagement, alleviated the parenting stress, and improved the quality of life in both children and parents. The preliminary findings have shown great potential for improving the quality of life and enhancing the mental and well-being of both parents and their children with autism. The findings support the effectiveness of the group-based parent coaching compared to the self-directed condition on the child and parent outcomes, suggesting the possibility of using videoconferencing to deliver structured group-based parent coaching.

There are several limitations in the study. First, the participants recruitment and sampling were restricted regarding the nature of the telehealth. Families who did not have access to the internet or digital devices were excluded from the current study. The majority of participating parents in the study had a college degree or higher. There were four fathers participating the study, and their allocation were based on the randomization. Future research should consider the demographic balance between groups. Moreover, most qualitative responses came from parents who completed the intervention. There was a lack of information from those who did not complete the program or dropped out. Meanwhile, the intervention completion rate in the self-directed condition was relatively lower (50% verse 90%). Future telehealth intervention should consider strategies to promote completion rate, such as dividing the whole intervention into multiple stages with several breaks or intensive intervention at first with prolonged low frequency follow-up phase.

5.1 Implications for Practice

Several lessons that we learned from this dissertation would sheds light on current clinical practice. First, video-based learning materials including lectures, demonstrations, and commentary videos could work as intervention strategies in digital or telehealth intervention. We

used two telehealth formats in the current study which connected patients to knowledge or training, as well as patients to professionals or peers. In addition, different levels of assistance were provided to these two conditions, written feedback only and group coach with written feedback. Clinicians should consider providing different levels of support according to the needs and priority of the families. Telehealth strategies that are accepted by parents of children with autism should be integrated in the telehealth practice, such as tailored feedback, peer commenting, live coaching, and guided reflection. Lastly, the use of videoconferencing in delivering group-based coaching sessions for parents of children with autism has emerging evidence. The structured group reflection which adopted from the family-centered capacity-building approach may lead to increased quality of life and positive outcomes for both children and parents.

5.2 Recommendations for Future Research

The development of high-quality, scalable, and sustainable clinical services is extremely needed in low-resource communities. Cultural adaptation studies should adopt formal and contemporary theories to guide intervention development, evaluation, and implementation, with ultimate goals to promote the health and well-being of children with autism and their families. There are multiple ways that evidence-based treatments could be culturally adapted. The real-world situation and clients' needs should be considered to prevent dramatic health disparities in ethnic minority communities. Future investigations would benefit from understanding the relationship between parenting stress, parents' mental health, and children's behavior outcomes to better promote parents' mental health.

More research is needed to determine the feasibility and effectiveness of culturally appropriate programs or instructional materials across a variety of contexts. For example, our

modified telehealth intervention needs to refine accordingly, the effectiveness of the upgraded version needs to be determined in a large-scale of RCT. Future telehealth studies should consider technology and infrastructure challenges and expand testing on different dosages of assistance from the therapist. More clinical guidelines should be established to guide group-based parent training with structured activities.

5.3 Conclusion

This dissertation adds to the limited existing literature on cultural adaptation of a current evidence-based intervention for parents in China. A 12-week group-based parent coaching intervention was adapted based on Parent-mediated Early Start Denver Model. The intervention was delivered via telehealth and tailored to the Chinese context. This culturally adapted parent coaching intervention taught family caregivers how to integrate evidence-based intervention strategies into everyday routines and home activities. Two telehealth service conditions were compared: a self-directed condition and a web + group therapy condition. First, the use of telehealth was acceptable, appropriate, and feasible for Chinese families. Second, promising feasibility results suggest it was feasible to deliver such a telehealth intervention in the Chinese context. The feasibility findings of the RCT provide support to a large-scale RCT in the future. Third, the preliminary effectiveness results indicate the telehealth intervention effectively improved children's communication skills and social engagement and alleviated parents' parenting stress and anxiety. Moreover, the telehealth intervention effectively improved the quality of life in both children and parents from both telehealth conditions. Group-based coaching via videoconferencing could be a promising home-based service model to increase parental perceived competence and decrease parents' anxiety.

This dissertation highlights the cultural adaptation of a current EBP, and it may serve as a reference for clinicians to develop culturally appropriate interventions. The preliminary findings in feasibility, implementation, and effectiveness show that this culturally adapted telehealth intervention has great potential in Chinese communities. The effectiveness of this culturally adapted telehealth intervention should be further determined on a large-scale RCT with different dosages of assistance or across a variety of contexts.

Appendices

Appendix A

Program Content

Week 1: Introduction to the Parent Program

1. Lecture Videos:
    a. Introduction: University of Michigan online parent program
    b. Guideline of the online parent program and Canvas tutorial
    c. Understanding autism and its key characteristics
    d. Children's developmental trajectory: how to choose age-appropriate activities for your child
    e. Taking care of you and your family: parent mental health and coping strategy
    f. Tutorials: Canvas tour and how to submit homework

Week 2: How to Capture Your Child's Attention

1. Lecture Videos
    a. Identify what captures the child's attention
    b. Position yourself into the child's attention
    c. Eliminate distractions & identify your child's social comfort zone
    d. Follow your child's lead
    e. How to use Demo video
2. Demonstration and Commentary videos
    a. Demo 1: Positioning yourself into the child's attention, verbal, with/without toy
    b. Demo 2: Positioning yourself into the child's attention, verbal, reading a book
    c. Demo 3: Positioning, nonverbal, dressing
    d. Demo 4: Following your child's lead, verbal, playing with blocks
    e. Demo 5: Following your child's lead, nonverbal, playing with blocks
    f. Demo 6: Following your child's lead, verbal, playing with objects
    g. Demo 7: Imitate your child, verbal, action imitation
    h. Demo 8: Imitate your child, verbal, drawing

Week 3: How to Find Fun in Sensory Social Routines

1. Lecture Video:
    a. Basic concept of sensory social routines
    b. Find the rhythm of sensory social routines (SSR)
    c. Set up your activity routines
    d. Optimize your child's energy level of learning
    e. Summary
2. Demonstration and Commentary videos
    a. Demo 1: Sensory social game, nonverbal/verbal, peek a boo
    b. Demo 2: Repetition, verbal, children's song
    c. Demo 3: Pausing, nonverbal, children's song, row a boat
    d. Demo 4: Highlight of the SSR, nonverbal/verbal, tickling
    e. Demo 5: Object usage & control, nonverbal, peek a boo
    f. Demo 6: Use objects in the sensory social routines, nonverbal, Ball tapping and bouncing
    g. Demo 7: Change the rhythm: two versions of physical game, nonverbal, singing and dancing
    h. Demo 8: Family activities, verbal, dancing

Week 4: How to Build Back-and-Forth Interactions with the Child

1. Lecture Videos:
    a. Review previous weeks
    b. Importance of back-and-forth interactions (taking turns)
    c. The four-step to set up the joint activity
    d. Set the theme
    e. Add in variations
    f. Close up and transition
    g. Create joint activities in your daily routines + summary
2. Demonstration and Commentary videos
    a. Demo 1: Turn taking & share controls, verbal, reading
    b. Demo 2: Turn taking & balanced interaction: one-word-up rule, verbal, reading
    c. Demo 3: Theme set-up: JA theme, nonverbal, Peek a boo
    d. Demo 4: Add in variation, verbal/nonverbal, Play-Doh
    e. Demo 5: Closing/transition, verbal, eating-mealtime

Week 5: Talking Bodies: How to Help Your Child Use Nonverbal Communication

1. Lecture Videos:
    a. What is nonverbal communication and why is it important?
    b. Do less, so your child does more
    c. Wait for it
    d. Create practice opportunities for nonverbal communication (communicative gestures)
    e. Consistency & pay attention to your position
    f. Increase your child's understanding of other's nonverbal communication
2. Demonstration and Commentary videos
    a. Demo 1: Nonverbal communication cues, verbal/nonverbal, toy play
    b. Demo 2: Gestures to close up, nonverbal, reading
    c. Demo 3: Provide options, verbal, blocks
    d. Demo 4: Integrate communicative gesture into activities, nonverbal, doll play
    e. Demo 5: Integrate gestures into activities, nonverbal, tickling
    f. Demo 6: Integrate gestures into activities, nonverbal, opening a container
    g. Demo 7: Gesture and body movements imitation in daily activities, nonverbal, physical play, acting out a scene
    h. Demo 8: Create challenges or opportunities, verbal, drink milk

Week 6: Do What I Do: How to Help Your Child Learn by Imitating

1. Lecture Videos:
    a. What is imitation and why is it important?
    b. Sound imitation
    c. Action imitation: the object operation
    d. Action imitation: gestures and body/facial movements
    e. Action imitating: activities expansion
    f. Integrating imitation games into the joint activity
2. Demonstration and Commentary videos
    a. Demo 1: Imitate your child's sound, verbal, funny sounds game
    b. Demo 2: Imitate the body movement, use of object, language, and ways of playing, verbal, object play, finger games
    c. Demo 3: Imitate actions: the object operation, nonverbal, Play-Doh
    d. Demo 4: Imitating and expanding on ways of playing, verbal/nonverbal, cars
    e. Demo 5: Imitating and expanding on ways of playing: verbal/nonverbal, balls
    f. Demo 6: Activity model and expansion, verbal, washing/bathing
    g. Demo 7: Integrating imitation games into the joint activity, verbal, putting on shoes

Week 7: The ABC's of Learning: Interactions using Antecedent – Behavior – Consequence

1. Lecture Videos:
    a. What the ABC's of learning is and why is it important?

b. Pay attention to what your child does: B is for behavior
c. Choose the reward: C is for consequence
d. Identify what came first, right before the behavior occurred: A is for antecedent
e. Replace "naughty" behaviors with ABC's of learning
f. Use the ABC's to increase your child's learning opportunities and teach your child new skills
g. Summary

2. Demonstration and Commentary videos
    a. Demo 1: Behavior and goal, verbal, puzzles and blocks
    b. Demo 2: Behavior and goal 2, verbal, request behaviors
    c. Demo 3: The antecedent-behavior-consequence, nonverbal, toy play
    d. Demo 4: The antecedent-behavior-consequence, nonverbal, peek a boo
    e. Demo 5: Use the ABC's to teach your child new behaviors, verbal, toy play, pretend play

Week 8: The Joint Attention Triangle: Sharing Interest with Others

1. Lecture Videos:
    a. What is joint attention and why is it important?
    b. Teach your child to give objects
    c. Teach your child to show objects
    d. Teach your child to point and share experiences
    e. Summary
2. Demonstration and Commentary videos
    a. Demo 1: Initiate and follow the joint attention: read the cues, verbal/nonverbal, toy play
    b. Demo 2: Giving the objects to the child, verbal, toys
    c. Demo 3: Showing the object functions, verbal, umbrellas-object function
    d. Demo 4: Showing the object functions, nonverbal, put on a hat
    e. Demo 5: Giving, showing, pointing with labelling, verbal, kitchen toys
    f. Demo 6: Labelling the options: verbal, coloring

Week 9: How to Set Up Play for Your Child

1. Lecture Videos
    a. The definition of play and its stages
    b. Set up the play for independence
    c. Ease out your role as a partner in play
    d. Reduce support during the setup, closing and transition
    e. Change toys frequently
    f. Move away while your child plays
2. Demonstration and Commentary videos
    a. Demo 1: Environment set up and reward chart

Week 10: Pretend Play: How to Help Your Child Learn through Play

1. Lecture Videos
    a. What is pretend play and why is it important?
    b. Conventional and functional play
    c. Pretend play with dolls
    d. From imitation to symbolic play
    e. Symbolic substitutions during the pretend play
    f. Develop symbolic combinations
2. Demonstration and Commentary videos
    a. Demo 1: Pretend play: verbal/nonverbal, feeding a toy
    b. Demo 2: Transition from imitation to natural symbolic play, nonverbal, bedtime routines
    c. Demo 3: Natural environment: daily life scenes, v, mealtime routines

Week 11: How to Promote Your Child's Speech Development

1. Lecture Videos
    a. What is speech development and why is it important?
    b. Build your child's vocabulary of sounds

    c. Vocal games with your child's sounds
    d. Increase opportunities for the child to listen and respond to others
    e. Talk to your child in a way that promotes language development
    f. Combine sounds with gestures
    g. Promote your child's understanding of language
2. Demonstrations and Commentaries
    a. Demo 1: Vocal games, verbal/nonverbal, funny sounds, vocal play
    b. Demo 2: Label and narrate, verbal, object and toy play
    c. Demo 3: One-word-up rule, verbal/nonverbal, tickling
    d. Demo 4: Combine sounds with gestures, nonverbal, giving, showing, pointing
    e. Demo 5: Respond more, follow up more, command less, nonverbal, play-doh

Week 12: Program Summary

1. Lecture Videos:
    a. Program review
    b. Program summary

Appendix B

Weekly Group Agenda

Week 1 Schedule: Welcome & Ice break session

1. Briefly introduce yourself
2. DingTalk videoconferencing meeting instruction
    1) Software features: mute/share screen
    2) Chat box: desktop version
    3) Participate in the discussion
3. Group members
    1) Introduce yourself
        A. City
        B. Who are you living with: child's age?
        C. What do you want to gain the most from group therapy session?
4. Purpose of group therapy session
    1) 12-week schedule
    2) Your responsibility/homework and feedback: submission/feedback
    3) Group therapy session: rules for speaking and courtesy
    4) Group therapy session: typical routine
5. Q&A

Week 2 Schedule: How to capture the child's attention

Focus: 1. Face-to-face position; 2. Follow the child's lead: actively listen, imitate, offer help, and narrative

1. Activity 1: Review of previous week's activity
    a. Please share a successful experience with one of the techniques you learned from last week
2. Activity 2: Video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements

    -- Advantage

    -- How to improve
3. Activity 3: Guided video reflection

    -- Live coaching session: imitation/narrative and demonstration (PRIDE）

    -- Practice
4. Activity 4: Translation to daily lives

    -- Brainstorm: everyday activity

    -- Which daily activity is hard for the techniques learned this week to be incorporated in?

5. Q&A

Week 3 Schedule: How to find pleasure during interaction

Focus: 1. Pause before the highlight: Pause and wait. 2. Add in some variations. 3. Home activities: sensory social routines and games with objects. 4. Same activity—different versions.

1. Activity 1: Review of previous week's activity
    a. Please share 2 sensory social routines that you often practiced at home with your child
2. Activity 2: Video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements

    -- Advantage

    -- How to improve
3. Activity 3: Guided video reflection

    -- Changes in activity—how to diversify the types of activity

    -- Discuss
4. Activity 4: Translation to daily lives

    -- Brainstorm: everyday activity-find the child's optimal state

    -- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/ Exercising

    Most optimal state?
5. Q&A

Week 4 Schedule: How to develop a back-and-forth interaction

Focus: a. activity setup: by following the child, capturing the child's center of attention. b. activity theme: alternating behaviors. c. change in activity: if alternating quality is not high, skip this step. d. end of activity/transition

1. Activity 1: review of previous week's activity
    a. Q: please share two activities that you did with the child at home (alternating)
2. Activity 2: video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements

    -- Advantage

    -- How to improve
3. Activity 3: guided video reflection

    -- "Four-part framework"

        -how to decide on a theme?

        -how to start it?

        -how to end the activity/make a transition?

        -how to change things up? (Diversify the activities)

    -- Discussion
4. Activity 4: Translation to daily lives

    -- Brainstorm: everyday activity-design the activity frames using the four-part framework

    -- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/ Exercising
5. Q&A

Week 5 Schedule: Nonverbal communication

Focus: a. Demonstrate hand gestures for the child. b. Incorporate communicative hand gestures into the activity. c. Create "challenges"

1. Activity 1: review of previous week's activity
    a. What interesting activities did you do with your child over the break?
2. Activity 2: video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements

    -- Advantage and improvement

    -- Discussion
3. Activity 3: guided video reflection

    -- AAC: Augmentative and Alternative Communication

    -- Visual support: picture/process

    1. Demonstration; 2. Interesting; 3. Wait; 4. Respect the child's autonomy: don't assume; 5.Use! Not test; 6. Respond all the child's communication; 7. Find tiny success
4. Activity 4: Translation to daily lives

    -- Brainstorm: everyday activity: use of hand gestures/picture process

    -- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/
5. Q&A

Week 6 Schedule: How to help the child to learn to imitate

Focus: 1. imitate the child's: sound, movement of operating objects, body movement/hand gestures/facial expression. 2. direct the child appropriately to imitate. 3. taking turns + joint activity frame. 4. staying within the child's center of attention. 5. embrace the child's imperfect performance, find similar movements

1. Activity 1: review of previous week's activity
    a. Q: since we are halfway through the program by now, please share the biggest change you or you child have experienced so far.
2. Activity 2: video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements
        - advantage/ways to improve
        - discussion
3. Activity 3: guided video reflection
    a. build interesting and new scenarios through action to facilitate the child's ability to imitate
    b. expansion on imitation within joint activity
4. Activity 4: Translation to daily lives
    a. Brainstorm: everyday activity- incorporate imitation into joint activity frame
5. Activity 5：midterm summary + Q&A
    a. Week 1: how to capture the child's center of attention
    b. Week 2: how to find pleasure in sensory social routines

c. Week 4: How to Build a Back-and-Forth Interactions with the child
d. Week 5: How to help the child use nonverbal communication
e. Week 6: How to help the child learn to imitate

Week 7 Schedule: ABC principle

Focus: a. challenging behavior replacement. b. reward: use end result to highlight previous behavior. c. precondition: environment setup, reminder, hand movements, etc. d. use of everyday life activity

1. Activity 1: review of previous week's activity
    a. Please share a successful example using the rewards, use end result to highlight previous behavior, or examples of abc principle reflected in interactions with the child
2. Activity 2: video recorded parent child interaction
    a. Play the homework video from last week, please point out parts where the parents did a good job or needed more improvements

    -- Advantage/How to improve
3. Activity 3: guided video reflection

    -- Where is A-B-C?

    -- Replacement behavior?
4. Activity 4: Translation to daily lives

    -- Brainstorm: what everyday life reflect ABC principle?

    -- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/Exercise
5. Q&A

Week 8 Schedule: Joint attention

Focus: a. teaching the child to give you the object. b. teaching the child to show you the object. c. teaching the child to point at the object

1. Activity 1: review of previous week's activity
    a. Please share a successful example from last week on effectively demonstrating joint attention with the child
2. Activity 2: video recorded parent child interaction
    a. Please get ready to discuss the homework videos around the following 5 topics

    -- Activity theme

    -- Environment preparation: toys/scenarios, etc.

    -- How to set up the activity

    -- Using the techniques

    -- Questions needed to be discussed/technique
3. Activity 3: guided video reflection
    a. Please get ready to discuss the homework videos around the following 5 topics

    -- Activity theme

    -- Environment preparation: toys/scenarios, etc.

    -- How to set up the activity

    -- Using the techniques

    -- Questions needed to be discussed/technique

4. Activity 4：Translation to daily lives

-- Brainstorm: which everyday activity reflects joint attention?

-- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/Exercise

5. Activity 5: Q&A

Week 9 Schedule: How to play for your child

Focus: 1. teach the child to play games, easy to hard, develop gradually; 2. demonstrate first, and instruct if needed. remove instructions as soon as possible; 3. use joint activity and four-part framework: prepare, theme, change, end/transition: Teach the child more techniques for games; 4. use good organization, sit behind the child's back, separate from the child slowly to encourage them to play independently; 5. alternate between different toys to avoid boredom for the child.

1. Activity 1: review of previous week's activity
2. Activity 2: video recorded parent child interaction
    a. Please get ready to discuss the homework videos around the following 5 topics

    -- Activity theme

    -- Environment preparation: toys/scenarios, etc.

    -- How to set up the activity

    -- Techniques used

    -- Questions needed to be discussed/technique
3. Activity 3: guided video reflection
    a. Please get ready to discuss the homework videos around the following 5 topics

    -- Activity theme

    -- Environment preparation: toys/scenarios, etc.

    -- How to set up the activity

    -- Techniques used

    -- Questions needed to be discussed/technique
4. Activity 4: Translation to daily lives

-- Brainstorm: How to set up play for your child in everyday life

-- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/Exercise

5. Activity 5: Q&A

Week 10 Schedule: pretend play

Focus: a. teaching conventional and functional skills for games; b. animate dolls and animal toys; c. transition from imitation play to spontaneous symbolic play; d. transition into symbolic play; e. Develop Symbolic Combinations.

1. Activity 1: review of previous week's activity
    a. Q: please share a successful example from last week on how to use pretend play effectively
2. Activity 2: video recorded parent child interaction
    a. Please get ready to discuss the video homework around the 5 following topics

    -- Activity theme

    -- Environment preparation: toys/scenarios, etc.

    -- How to set up the activity

-- Techniques used
-- Questions needed to be discussed/technique

3. Activity 3: guided video reflection
    a. Please get ready to discuss the video homework around the 5 following topics

-- Activity theme
-- Environment preparation: toys/scenarios, etc.
-- How to set up the activity
-- Techniques used
-- Questions needed to be discussed/technique

4. Activity 4: Translation to daily lives

-- Brainstorm: which daily activity can be pretend play?

5. Activity 5: Q&A

Week 11 Schedule: How to facilitate speech development

Focus: 1. increase expectation for the child; 2. continue imitating the child's voice for vocal games; 3. labeling of object, action, and traits: explanation=meaning assigned; 4. Use simple language and follow the one-word-up rule; 5. If you want the child to say something, speak it to them first; 6. Give less instructions, respond more, and follow up more.

1. Activity 1: review of previous week's activity
    a. Q: Please share a successful example from last week: how to effectively facilitate the child's language?
2. Activity 2: video recorded parent child interaction
    a. Please get ready to discuss the video homework around the 5 following topics

-- Activity theme
-- Environment preparation: toys/scenarios, etc.
-- How to set up the activity
-- Techniques used
-- Questions needed to be discussed/technique

3. Activity 3: guided video reflection
    a. Please get ready to discuss the video homework around the 5 following topics

-- Activity theme
-- Environment preparation: toys/scenarios, etc.
-- How to set up the activity
-- Techniques used
-- Questions needed to be discussed/technique

4. Activity 4: Translation to daily lives
    a. How to facilitate language in different settings of everyday lives?

-- Brainstorm: which everyday activities facilitate language development?
-- Getting up from bed/Eating a meal/Outdoor activity/ Dressing/Showering/Exercise

5. Activity 5：Q&A

Appendix C

Activities and Roles in Weekly Group Session

Appendix Table 1. Activities and Roles in Weekly Group Session

Activity	Purpose	Therapist role	Parent role	Duration (minutes)
Review of previous week's activity	Review, identification of successes/ challenges	Listener	Lead: Reporter	**15**
Video-recorded parent-child interaction	Mediate child learning of the targeted outcome	Observer Commenter	Lead: Implementer	**15**
Guided video reflection	Reflectively assess parent mediation and child engagement	Shared lead: Facilitator	Shared: Reflector	**20**
Activity planning for the future	Translate conceptual learning into daily plans	Shared role: Facilitator	Shared role: Translation to daily activities	**20**
Translation into daily interactions	Integrate concepts into everyday activities	Background support	Lead role: Implementer Reflector	**20**

Note. This table was adapted and modified from Schertz and Horn (2017)'s Table 5

Appendix D

The Structure of Parent Group Therapy Session (Template)

Parent Group Therapy Session (Template)

Date: _ Session: __Group number:__

Meeting #1 Agenda

Activity 1: Review of previous week's activity	*Duration: 20 (3 minutes each)*
Note:	
Activity 2: Video-recorded parent-child interaction	*Duration: 20 (3 minutes each)*
Note:	
Activity 3: Guided video reflection	*Duration: 10 minutes*
Note:	
Break	
Activity 4: Activity planning for the future	*Duration: 20 (3 minutes each)*
Note:	
Activity 5: Translation into daily interactions	*Duration: 20 (3 minutes each)*
Note:	
End of Session	

家长群组讨论会议 (Chinese Version**)**

日期：___ 会议#：___组号：

会议#1 日程

活动 1：上周回顾	*时长：20 (每人 3 分钟)*
笔记：	
活动 2：亲子互动视频案例讲解	*时长：20 (每人 3 分钟)*
笔记：	
活动#3：互动视频讨论	*时长：10 分钟*
笔记：	
中场休息	
活动#4：下周活动计划	*时长：20 (每人 3 分钟)*
笔记：	
活动#5：日常互动的转化	*时长：20 (每人 3 分钟)*
笔记：	
讨论结束	

Appendix E

Program Evaluation Survey Questions

1. What is your overall satisfaction with program contents of this web-based program?

- o Very Dissatisfied
- o Dissatisfied
- o Neutral
- o Satisfied
- o Very Satisfied

2. What is your overall satisfaction on the Telehealth delivery of this web-based program?

- o Very Dissatisfied
- o Dissatisfied
- o Neutral
- o Satisfied
- o Very Satisfied

3. Would you recommend this web-based program to families with the same needs?

- o Very Unlikely
- o Unlikely
- o Neutral
- o Likely
- o Very Likely

4. I like the content of this web-based program.

- o Very Disagree
- o Disagree
- o Neutral
- o Agree
- o Very Agree

5. I feel that the Telehealth delivery of this web-based program is appealing to me.

- o Very Disagree
- o Disagree

- Neutral
- Agree
- Very Agree

6. I think that the content of this web-based program seems applicable to my situation.

- Very Disagree
- Disagree
- Neutral
- Agree
- Very Agree

7. I think the Telehealth delivery of this web-based program seems like a good match to me compared to the in-person format.

- Very Disagree
- Disagree
- Neutral
- Agree
- Very Agree

8. I think the skills learnt from this web-based program seems implementable to daily life.

- Very Disagree
- Disagree
- Neutral
- Agree
- Very Agree

9. I think it is feasible to participate this web-based program through Telehealth delivery.

- Very Disagree
- Disagree
- Neutral
- Agree
- Very Agree

10. Please rate the difficulty level of this web-based program?

- Very difficult
- Difficult
- Neutral
- Easy
- Very easy

11. How much background information or knowledge do you think is needed to learn this web-based program?

- Very little needed
- Little needed
- Neutral
- Somewhat Needed
- Much needed

12. How often do you study this web-based program every week?

- <2 times/week
- 2 - 4 times/week
- 5 - 7 times/week
- 7 - 9 times/week
- >10 times/week

13. How much do you think you have improved by learning the relevant intervention skills each week?

Topics	Not improved at all 1	2	3	4	Greatly improved 5
WK2- Increasing the child's attention					
WK3- Sensory social routines					
WK4- Dyadic engagement					
WK5- Nonverbal communication					
WK6- Imitation					
WK7- ABC's of learning					
WK8- Joint attention					
WK9- Play					
WK10- Pretend play					
WK11- Speech development					

14. How confident are you to use the following intervention skills after the program?

Topics	Not confident at all 1	2	3	4	Very confident 5
WK2- Increasing the child's attention					
WK3- Sensory social routines					
WK4- Dyadic engagement					
WK5- Nonverbal communication					
WK6- Imitation					
WK7- ABC's of learning					
WK8- Joint attention					
WK9- Play					
WK10- Pretend play					
WK11- Speech development					

Questions in Chinese:

1. 请问您对本研究课程相关教学内容整体满意程度?
2. 请问您对本研究课程远程形式 (线上授课) 的整体评价?
3. 请问您是否会将本课程推荐给相同需要的家庭?
4. 我喜欢本研究课程的教学内容。
5. 我认可本研究课程线上授课这种远程教学形式。
6. 我认为本研究课程的教学内容非常实用。
7. 我认为本研究课程的线上授课形式比线下教学形式更适用于我。
8. 我认为本研究课程的教学技巧可运用到日常生活中。
9. 我认为本研究课程采取的线上教学形式可行。
10. 请您对本课程的难易程度打分?
11. 您认为学习本课程是否需要具备相关背景知识?
12. 您每周学习本课程的频率如何?
13. 您认为每周课程所教授的相关干预技巧，通过学习您提高了多少?
14. 课程结束后，您有多少信心继续使用以下相关技巧

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