EVALUATION OF AN EARLY START DENVER MODEL-BASED INTERVENTION FOR YOUNG CHILDREN WITH AUTISM IN AN INCLUSIVE PRESCHOOL SETTING

BY

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ABSTRACT

Autism spectrum disorder (ASD) is a neurodevelopmental disorder defined by difficulties in social communication and the presence of restricted or repetitive behaviours or interests. There is evidence to suggest that early intervention (EI) can lead to improved outcomes for children with ASD. Inclusive preschool-based delivery of EI appears to satisfy current legal and best-practice recommendations around the delivery of EI for young children with ASD. It may also offer several potential benefits including cost-effectiveness, efficiency and opportunities for children with ASD to learn from their peers. The Early Start Denver Model (ESDM) is a promising naturalistic behavioural developmental intervention for young children with ASD aged between 12 and 60 months. The ESDM can be delivered to children in a group-based format and several studies have demonstrated its effectiveness when delivered for 15 to 25 hours per week in designated ESDM preschools with low child–teacher ratios. However, the preschools involved in these studies may not be representative of the typical preschool setting for many communities. Thus, more research is needed to determine the effectiveness of this intervention when delivered under conditions that more closely reflect the typical real-world preschool setting.

In the present thesis, two studies with multiple probe across participants designs, each involving three preschool children with ASD, examined the feasibility and effectiveness of the use of the ESDM in an inclusive preschool setting. Specifically, Study 1 evaluated the effectiveness of a modified version of ESDM therapy delivered by a certified therapist and Study 2 evaluated (a) the effectiveness of a brief ESDM coaching programme, and (b) the effectiveness of a modified version of ESDM therapy delivered by preschool teachers. For both studies, the intervention was delivered in regular community preschools and no major changes were made to the typical preschool environments or routines. Effectiveness was assessed by measuring improvements in child active participation, vocal/verbal communication and imitation, and, for Study 2, teachers' fidelity of implementation of ESDM techniques. Teachers' perceptions of the acceptability and effectiveness of the intervention were also assessed via a questionnaire and in-depth interviews.

In Study 1, an outside certified therapist delivered 3 hours per week of ESDM to three children with ASD over an 8- to 10-week period. Participants showed improvement in active participation, imitation and either intentional vocalisations or spontaneous functional utterances. These results were generally maintained at follow-up. For Study 2, a brief coaching programme was used to train three preschool teachers to use the ESDM with a child with ASD who attended the inclusive preschools where they worked. Teachers improved in

their use of the ESDM strategies and children demonstrated improved levels of active participation but results for child imitation and communication were mixed. Teachers also found the intervention to be acceptable and effective. Together, the results from these studies provide preliminary support for the feasibility and effectiveness of the ESDM when delivered in real-world inclusive preschool settings. More research is needed to determine the most effective approach to delivering EI for ASD in an inclusive preschool setting. It may also be valuable to evaluate the extent to which gains made by children and teachers during intervention generalise to other people and/or settings.

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PUBLICATIONS ARISING FROM THIS THESIS

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DECLARATION BY THE AUTHOR

This thesis is composed of original work conducted by me in fulfilment of a PhD under the supervision of Professor Jeff Sigafoos and Dr.s Larah van der Meer and Hannah Waddington from the School of Education at Victoria University of Wellington. No part of this thesis has been previously submitted for any other degree or diploma. Work by other authors has been referenced in the text and others' contributions have been clearly stated. The studies included in this thesis received ethical clearance from the New Zealand National Health and Disability Ethics Committee (Reference Number 18/CEN/29/AM01, see Appendix A).

My primary supervisor, Professor Jeff Sigafoos, provided input into the design, analysis and interpretation of results and editing of all chapters in this thesis. Dr. Larah van der Meer provided input into the design, analysis of data, and editing for the literature review and Study 1. Finally, Dr. Hannah Waddington, provided input into the design of Studies 1 and 2, as well as assistance with data analysis, interpretation of results and editing for all chapters. Aside from this input, the studies presented in this thesis were designed and conducted by me.

This thesis includes three original papers published in peer reviewed journals, these are presented in Chapters 2, 4 and 5. All changes made to the original published versions of these papers have been clearly detailed at the beginning of each chapter. My contribution to each co-authored paper is outlined at the front of each publication. I have included the publication agreements for each article in Appendix B as evidence of the publishers' permission to include the articles in this thesis.

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PREFACE

Overview of Thesis

There are seven chapters in this thesis. Four chapters have been written in traditional thesis format. The remaining three chapters (Chapters 2, 4 and 5) include journal articles that have been written in a format suitable for publication. Because of this, there is some repetition of content across these chapters. Effort has been made to reduce confusion by clearly defining and describing the purpose of each chapter:

Chapter 1 is an introduction to the thesis. It provides an overview of autism spectrum disorder (ASD), approaches to early intervention for ASD, the Early Start Denver Model and early intervention in the New Zealand context.

Chapter 2 presents the rationale for the research in the present thesis. Specifically, it provides rationale for the delivery of EI by teachers in an inclusive preschool setting. This chapter includes a literature review that was previously published in the *Review Journal of Autism and Developmental Disorders.*

Chapter 3 presents the purpose of the studies in this thesis, the research questions that the studies seek to address and a methodological overview.

Chapter 4 is a journal article that was previously published in the *International Journal of Developmental Disabilities.* The article presents a study evaluating the use of an ESDM-based intervention by a certified therapist in a real-world preschool setting.

Chapter 5 is a journal article that has been submitted for publication in the *Infants and Young Children.* The article presents a study evaluating the use of a brief coaching programme to train preschool teachers to deliver an ESDM-based intervention in an inclusive preschool setting.

Chapter 6 presents qualitative interviews conducted with the teachers who participated in Study 2. The purpose of the interviews was to understand the teachers' perceptions of the intervention.

Chapter 7 is a general discussion of the results of Studies 1 and 2 in relation to the research questions outlined in Chapter 3. The feasibility, effectiveness (in terms of child and teacher outcomes) and social validity of inclusive preschool-based delivery of the ESDM is discussed along with limitations, implications and suggestions for future research.

CHAPTER 1
INTRODUCTION
Autism Spectrum Disorder

Definition and Description

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that is characterised by social communication difficulties and the presence of repetitive behaviour patterns and a restricted range of interests (American Psychiatric Association, 2013). Neurodevelopmental disorders, such as ASD, are a group of disorders that: a) present early in an individual's life, b) are associated with impairment or delay in functions that are related to the central nervous system and c) usually progress relatively smoothly across an individual's lifespan, without major remissions or relapses (Bishop & Rutter, 2008). ASD is a heterogenous condition which means that the specific areas of impairment and the severity of impairment can vary widely across individuals (Masi, DeMayo, Glozier, & Guastella, 2017; Seltzer, Shattuck, Abbeduto, & Greenberg, 2004).

While the term ASD is of fairly recent origin, descriptions of individuals that may have had this disorder date back to the early 1800s (Gillberg, 2007). One such case was that of Hugh Blair of Borgue (Houston & Frith, 2000), an eccentric Scottish aristocrat from the 18th Century. According to historical court documents, Blair often behaved in socially inappropriate ways. For example, it is reported that he attended every funeral in the town where he lived, even if he had never met the individual that the funeral was honouring. He was also reported to have socialised with servants who openly mocked him, seemingly oblivious to their mocking. Along with these social difficulties, Blair reportedly displayed unusual behaviours such as collecting twigs, bird feathers and pieces of cloth and insisting on always wearing the same clothing. During his lifetime, Blair's behaviour was explained as mental incompetency or idiocy, but Houston and Frith (2000) suggested that Blair most probably had ASD.

The term autism is derived from the Greek word "autos" meaning self. It appears to have first been used by Swiss psychiatrist Eugen Bleuler to describe one of the core features of schizophrenia (Kuhn & Cahn, 2004). Indeed, ASD was originally believed to be a type of childhood psychosis or childhood schizophrenia (Gillberg, 2007). Bleuler used the term autism to label the state of social detachment and withdrawal into one's own inner world that is often displayed by individuals with schizophrenia. In 1943, the term 'autism' was first used as a distinct diagnostic concept by Leo Kanner (Vivanti, & Salamone, 2015). Kanner, an Austrian child psychiatrist who had emigrated to the USA, used the term "infantile autism" to

describe a group of 11 children who displayed social and communication deficits as well as rigid, obsessive behaviours. Kanner (1943) described these children as unable to "relate themselves in the ordinary way to people and situations" (p. 242) and suggested that their behaviour was "governed by an anxiously obsessive desire for the maintenance of sameness" (p. 245). He also suggested that the condition was biological in origin.

One year later in 1944, an Austrian paediatrician named Hans Asperger used the term "autistic psychopathy" to describe four young boys (Asperger, 1944) who shared many of the same features as the 11 children described by Kanner in 1943. Asperger described the boys as having social difficulties and obsessive interests or repetitive/obsessive behaviour. Asperger used the term "little professors" to describe these children, due to their precocious abilities in specific areas. Asperger's Syndrome, which is no longer a distinct diagnostic category but is instead included on the ASD spectrum, was named after Hans Asperger. When first coined, the term Asperger's Syndrome was considered to be a distinct condition that was less severe than the classic form of autism described by Kanner. Specifically, the children that Asperger described did not have the impairments in language or cognition that were described by Kanner.

Today, the core symptoms of ASD continue to include those originally described by Kanner (1943) and Asperger (1944), specifically: (a) social communication difficulties (e.g., limited eye contact, lack of imitation ability and limited expressive and receptive language skills), and (b) a restricted range of interests and ritualistic/repetitive behaviour. These symptoms are the key diagnostic features of ASD, which are delineated in the fifth edition of the Diagnostic and Statistical manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). The DSM is a psychological manual containing definitions and classifications of mental disorders, it is designed to be used for diagnosis, treatment and research. Autism was first included as a distinct diagnostic category in the third edition of the DSM (DSM-3; American Psychiatric Association, 1980). Since then, the diagnostic criteria for ASD have changed with each subsequent revision of the DSM (Leonard et al., 2010). However, all versions have included social difficulties and restricted or repetitive behaviours/interests as core characteristics of ASD. A significant change introduced in the DSM-5, is the conceptualisation of ASD as a spectrum disorder, rather than a set of discrete, mutually exclusive diagnostic categories. As a result, terms that were previously viewed as representing distinct conditions, specifically the terms Autistic Disorder, Asperger's Syndrome and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), are

now all subsumed under the broader umbrella term of ASD. However, in both historical and contemporary literature, the terms autism and ASD are often used interchangeably and can be considered synonymous (Vivanti & Salamone, 2015).

Prevalence

Current estimates place the prevalence of ASD at 1 in every 59 children in the US (Baio et al., 2018) and 1 in every 50 children in NZ (Ministry of Health, 2019). These estimates represent a significant increase in the number of children receiving an ASD diagnosis over the past few decades (Schwartz et al., 2004). Indeed, at the time of Kanner (1943), ASD was believed to be a rare condition, perhaps affecting only approximately 4 in every 10,000 children (Simpson, 2004).

There is considerable debate regarding the reasons for this apparent increase in the prevalence of ASD and it is likely that there are many inter-related reasons (May & Williams, 2018). Some have argued that the increase is due to advances in the awareness, understanding and diagnosis of ASD, as well as a broadening of the characteristics required for diagnosis (Matson & Kozlowski, 2011). Indeed, the increase in the number of children diagnosed with ASD in recent years has occurred alongside a corresponding increase in public awareness of ASD (Campisi et al., 2018). There is also some evidence to suggest that increased prevalence rates are, at least in part, attributable to changes in diagnostic and reporting practices. For example, in a review of 7003 cases in California, King and Bearman (2009) concluded that 25% of the increase in ASD prevalence rates that was observed from 1992 to 2005 could be attributed to changes in diagnostic practices, specifically diagnostic substitution. The authors reported that increases in ASD prevalence rates for the study population directly corresponded with decreases in mental retardation[1] prevalence rates. Similarly, Shattuck (2006) analysed administrative prevalence rates from the US-wide special education population from 1984 to 2003 and found that increases in ASD prevalence rates were associated with corresponding decreases in rates of mental retardation and learning disabilities. A large Danish study by Hansen, Schendel, and Parner (2015) also found that changing reporting practices accounted for 60% of the increase in ASD prevalence rates from 1980 to 1991.

Increased prevalence rates might also be explained in part by improved survival rates for premature infants (Matson & Kozlowski, 2011), given evidence suggesting that extremely premature infants are at higher risk for a range of neurodevelopmental disorders, including

[1] Intellectual disability was formerly referred to as *mental retardation*

ASD (Johnson et al. 2010; Kuzniewicz et al., 2014; Limperopoulos et al., 2008; Limperopoulos, 2009). It has also been suggested that environmental neurotoxins may have contributed to an increase in prevalence rates (Mendola et al., 2002; Palmer et al., 2006; Windham et al., 2006), however at present there is no clear evidence to support this claim (Matson & Kozlowski, 2011). Finally, the apparent increase may be due, at least in part, to differences in the way that prevalence rates have been measured over time and across studies. Indeed, Fombonne (2002) noted that prevalence studies "have generally failed to control for changes in case-definition and case-finding methods" (p. 6). It is therefore difficult to make comparisons across prevalence studies and to interpret differences found in rates across time (Matson & Kozlowski, 2011).

There are significantly more males than females with a diagnosis of ASD, with some estimates suggesting a male-female ratio of 4:1 (Baio et al., 2018). The reasons for this gender imbalance are unknown, however, it has been suggested that males may be more biologically vulnerable than females, leaving them more susceptible to developing ASD (Wing, 1981). It is also possible that females are underrepresented in prevalence rates due to inherent biases in the ASD identification and diagnostic processes (Kreiser & White, 2014). Indeed, high risk infant studies, where infants with a sibling with ASD are enrolled before ASD symptoms are present and then later screened for ASD symptoms (typically around 3-years of age), have suggested male-female ratios of 2.8:1 (Ozonoff et al., 2011) and 1.65:1 (Zwaigenbaum et al., 2012). This suggests that when gender biases are controlled for in the identification of ASD, there may be less of a gender discrepancy in prevalence rates. Further, existing gender biases in the identification and diagnosis of ASD may be exacerbated by the predominance of male participants in ASD research (Kreiser & White, 2014). Specifically, the development of screening and diagnostic tools and expectations concerning the presentation of ASD symptoms are informed by research literature which tends to be based on predominantly male samples (Thompson, Caruso, & Ellerbeck, 2003). Also, several community-based population studies from outside the US have produced lower male-female ratios (Messinger et al., 2015), perhaps suggesting a cultural influence on gender ratios. Finally, it has been suggested that females may be better at masking/camouflaging ASD symptoms so may not exhibit the typical ASD behaviours that are generally required for a diagnosis (Hull et al., 2019).

Aetiology

Explanations regarding the causes of ASD have shifted over time, in line with research findings. Over the past several decades, a number of different causes of ASD have

been suggested. Bettelheim (1967), for example, argued that inadequate parenting caused ASD. He claimed that:

> In those children destined to become autistic, their oversensitivity to their mother's emotions may be such that they try, in defence, to blot out what is too destructive an experience for them . . . to blot out emotional experience probably impedes the development of cognition, and it may be that the two reinforce each other till autism results. (Bettelheim, 1967, pp. 398).

However, this assertion is not supported by any empirical evidence and has been widely rejected by the general academic community (Parellada et al., 2014).

Vaccinations, specifically thimerosal-containing vaccines and the measles, mumps and rubella (MMR) vaccine, have also been suggested as a possible cause of ASD (Miller & Reynolds, 2009). This suggestion can be traced back to a 1998 paper published by Wakefield et al. that described an apparent link between the receipt of the MMR vaccine and the onset of ASD in a group of six young children. The paper was later retracted, and a number of subsequent large-scale rigorous studies have failed to identify any link between vaccination and ASD (e.g. Hviid, Hansen, Frisch, & Melbye, 2019; Miller & Reynolds, 2009).

For most cases of ASD, the exact aetiology remains unknown (Modabbernia, Velthorst, & Reichenberg, 2017). However, several lines of evidence point to ASD having a biological/genetic basis (DiCicco-Bloom et al., 2006; Parellada et al., 2014). For example, numerous twin and sibling studies have demonstrated a high heredity component (Parellada et al., 2014; Campisi et al., 2018). In addition, it appears that approximately 25 to 35% of cases of ASD have an identified genetic aetiology (Wiśniowiecka-Kowalnik & Nowakowska, 2019). Furthermore, several genetic syndromes and genetic variations have been identified as causing ASD-type symptoms (Jensen & Spannagel, 2011). For example, in a meta-analysis of 18,381 individuals with ASD and 27,969 controls, Grove et al. (2019) identified five genome-wide significant loci associated with the presence of ASD as well as genetic overlaps between ASD and schizophrenia, major depression and educational attainment. However, the genetics of ASD also appear to be rather complicated in that it has been estimated that there may be more than 500 different genetic variants involved in ASD (Campisi et al., 2018). Thus, for most cases of ASD, there does not appear to be any identifiable genetic cause.

Research has also established differences between the brain structure and function of individuals with ASD and typically functioning individuals (DiCicco-Bloom et al., 2006; Ecker et al., 2013; Stanfield et al., 2008). For example, brain enlargement has been documented in children with ASD aged between 12 to 24-months. This brain enlargement

appears to be related to an overgrowth in brain volume which may be linked to the social deficits associated with ASD (Hazlett et al., 2017). Brain structural connectivity is also thought to be compromised in individuals with ASD, with connections between the frontal and temporal cortices particularly affected (Geschwind & Levitt, 2007). Other biological factors that may be involved in the aetiology of ASD include the immune, inflammatory, oxidative and mitochondrial systems (Parellada et al., 2014); as well as levels of social neuropeptides such as oxytocin (Jacob et al., 2007).

Environmental factors could possibly play a role in ASD aetiology and should not be dismissed (Campisi et al., 2018). Understanding epigenetics, that is the interaction between environmental and genetic variables, may therefore be critical to understanding the causes of ASD (Dawson, 2008; Modabbernia, Velthorst, & Reichenberg, 2017). However, research on environmental factors and their contribution to the development of ASD is currently limited as researchers have traditionally focussed their attention on understanding the genetic causes of ASD (Modabbernia et al., 2017). However, several specific environmental factors that might play a role in the aetiology of ASD have been suggested. These factors include diet, parental immune functioning, advanced parental age, exposure to inorganic mercury or lead and complications during birth. Although there is research to suggest a link between these factors and ASD (Campisi et al., 2018; Modabbernia et al., 2017), more research is needed to understand the mechanisms through which these factors impact upon the development of ASD.

Identification and Diagnosis

There are a number of methods available for diagnosing ASD in children. International data suggest that an ASD diagnosis is typically made between three and four years of age (Baird, Cass, & Slonims, 2003; Chawarska, Klin, Paul, & Volkmar, 2007; Christensen et al., 2019), while a recent New Zealand-based study found that the mean age of diagnosis in New Zealand is 6.6 years (Eggleston et al., 2019). The diagnostic process usually involves observation of the child using standardized protocols (Chawarska, Klin, Paul, & Volkmar, 2007). This general approach to diagnosis can be traced back to Polan and Spencer (1959) who developed the Checklist of Symptoms of Early Infantile Autism. This checklist has been viewed as a pioneering approach to the standardized assessment of autism (Baird, Cass, & Slonims, 2003). Today, the most widely used standardized tool for ASD diagnosis is the Autism Diagnostic Schedule – Second Edition (ADOS-2; Lord, Luyster, Gotham, & Guthrie, 2012). A toddler version of the ADOS-2 (Lord et al., 2012) allows for diagnosis in children as young as 12 months of age. The ADOS-2 is considered to be a gold standard

diagnostic tool and has been shown to have high rates of sensitivity and specificity (Kamp-Becker et al., 2018). In this context, sensitivity refers to the likelihood that an individual with ASD will be correctly identified as having ASD and specificity refers to the likelihood that an individual who does not have ASD will be correctly identified as not having ASD. Thus, where a measure has high sensitivity, there is a low risk of false negative results and where a measure has high specificity, there is a low risk of false positive results.

Even with standardized assessment protocols such as the ADOS-2, the diagnosis of ASD is a complex process (Campisi et al., 2018). This is because ASD cannot be diagnosed biologically, and diagnosis through behavioural observation includes a degree of subjective clinical judgement (Leonard et al., 2010). Perhaps because of this complexity, the ASD diagnosis might be missed or delayed (Marlow, Servili, & Tomlinson, 2019). The use of screening tools that are administered to an entire subset of the population (e.g. all children aged 18-months), referred to as population-level screening tools, may be important for improving the identification and subsequent diagnosis of ASD (Janvier et al., 2019). Routine population-level screening is recommended by the World Health Organisation (WHO; 2012) and the American Academy of Pediatrics (Johnson et al., 2007). There is also evidence to suggest that screening tools can reliably detect ASD in children aged 14 to 36 months (Sánchez-García et al., 2019) and may be more effective at detecting the signs of ASD than professional clinical judgement alone (Hamilton, 2006). Although screening tools appear to be effective at identifying children at risk of ASD (i.e. have high levels of sensitivity), they tend to have lower levels of specificity, meaning that children without ASD may be incorrectly identified as ‘at risk’ of developing ASD. Nonetheless, screening tools are generally considered to pose minimal risk and are relatively quick and easy to administer

There are a range of different screening tools available (Marlow, Servili, & Tomlinson, 2019), however most tools rely on parental reports of child behaviour as this appears to be the most feasible method of measurement for universal screening programmes (Young et al., 2019). The Modified Checklist for Autism in Toddlers (M-CHAT; Robins, Fein, Barton, & Green, 2001) appears to be the most widely used and studied standardized population-level screening tool. A revised version of this tool, the Modified Checklist for Autism in Toddlers—Revised (M-CHAT-R; Robins, Fein, & Barton, 2009) provides an updated version of the M-CHAT. For the M-CHAT-R, parents complete a brief written questionnaire and professionals use a follow-up protocol to clarify any ‘at-risk’ answers. It is argued that routine screening using standardised tools, like the M-CHAT-R, will make it

easier for professionals to identify ASD early, enabling earlier referrals for diagnosis and intervention (Marlow, Servili, & Tomlinson, 2019).

Early Intervention

With early identification comes the opportunity for early intervention (EI), which is important for several reasons. Firstly, new developments in brain imaging technology over the past several decades have revealed the plasticity of the human brain (Twardosz, 2012), particularly in the first six years of life (Dawson, 2008). Researchers are now aware that during the early years of a child's life, the brain is primed for optimal learning, especially in social and language domains (Franz & Dawson, 2019). Thus, the provision of intervention during this period of development could enable interventionists to capitalise on a brain that is in a state that is 'ripe' for learning. Further, research on experience-expectant neuroplasticity suggests that the social brain is shaped by early experiences (Twardosz, 2012), indicating that early social experiences are likely to have a long-term impact on an individual's social development (Johnson & Munakata, 2005). Thus, enhancing the social experiences of young children with ASD through EI may have an impact on the development of the areas of the brain responsible for social interaction.

From a developmental perspective, children with ASD are still on a similar developmental trajectory to their 'typically developing' peers during their first two years of life and effective intervention at this stage may help to keep them on a path of 'normal development' (Dawson, 2008). It is also suggested that the younger a child is when intervention begins, the better the outcomes for that child (Dawson, 2008; Debodinance, Maljaars, Noens, & Noorgate, 2017; Franz & Dawson, 2019; Vietze & Lax, 2018). However, the situation appears to be complicated as several studies have reported no significant relation between child age and intervention response (e.g., Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2007; Magiati et al. 2007; Reichow and Wolery 2009).

Nonetheless, multiple research studies have documented that EI can be effective in improving outcomes for young children with ASD (Dawson, 2008; Drahota, Aarons & Stahmer, 2012). For example, a recent meta-analysis of single-subject experimental studies focused on interventions for toddlers with ASD found that studies generally demonstrated positive overall intervention effects (Debodinance, Maljaars, Noens, & Noorgate, 2017). Further, an evidence-based practice review (Wong et al., 2015) identified 25 different practices, for use with young children with ASD, that met the threshold of evidence required to be classed as evidence-based practices.

Early Intervention Approaches

Comprehensive Interventions

The National Research Council on Autism Spectrum Disorders (2001) recommends that approaches to intervention should target the core deficits of ASD (i.e., communication and social impairments and repetitive behaviour). These types of intervention are often referred to as comprehensive. Comprehensive interventions tend to focus on a broad range of skills with the goal of impacting a child's overall development (Wong et al., 2015). They also tend to be delivered over a longer period of time than more focussed interventions which target a narrower range of specific skills (Aiello et al., 2019). According to Odom, Boyd, Hall and Hume (2010) interventions can be classed as comprehensive treatment models (CTMs) if they: (a) are based on a clear conceptual framework, (b) have manualised procedures, (c) are delivered for a duration of 12 months or more, and (d) target multiple outcomes. Examples of CTMs include the Lovaas Model (McEachin, Smith, & Lovaas, 1993), the Early Start Denver Model (Dawson & Rogers., 2010), TEACCH (Marcus, Schopler, & Lord, 2000) and the LEAP model (Strain & Bovey, 2011).

Theoretical Approaches

There are also a range of theoretical models upon which interventions may be based. These can range from "highly structured behavioural approaches" to "more social developmental approaches" (Debodinance, Maljaars, Noens, & Noorgate, 2017; p. 80). The following sections include a summary of approaches to EI drawn from three different theoretical/instructional foundations: behavioural, developmental and naturalistic, as well as a hybrid approach known as naturalistic developmental behavioural interventions.

Behavioural Interventions

From a behavioural perspective, ASD is viewed as a set of behavioural excesses and deficits (Ringdahl, Kopelman, & Falcomata, 2009). For example, motor or vocal stereotypy might be considered to be a behavioural excess and difficulty with social communication may be viewed as a deficit. The goal of behavioural intervention is to address these deficits and excesses by arranging the individual's environment to promote learning of adaptive behaviours.

Behavioural interventions are rooted in the science of applied behaviour analysis (ABA). Many of the ideas behind ABA can be traced back to the work of John B. Watson (Matson & Neal, 2009), who is often referred to as the 'father of behaviourism'. Although Watson is generally considered responsible for formulating ABA, psychologist, B.F. Skinner is attributed with refining and systemising the science and expanding its reaches beyond the

laboratory and into applied settings (Matson & Neal, 2009). Indeed, Skinner suggested that behavioural processes observed in animals in a laboratory setting were "immediately applicable to the behaviour of the individual" (Skinner, 1953, p. 78). Skinner is perhaps best known for his work on operant conditioning (Skinner, 1953), which focusses on how voluntary behaviour is shaped through the interaction between behaviour and environment (Ringdahl, Kopelman, & Falcomata, 2009).

A number of the principles of operant conditioning described by Skinner remain important to ABA today. Arguably the most fundamental of these is Skinner's three-term contingency, which describes the relations between a behavioural act and the events that precede and proceed it. According to Skinner (1953), all behavioural events consist of a discriminative stimulus, an operant response, and a reinforcer/punisher. Simply put, the discriminative stimulus sets the occasion for behaviour, the operant response is the behaviour that is evoked by the prior (antecedent) stimulus, and the reinforcer/punisher is the consequence that makes it more/less likely that the behaviour will occur again.

The three-term contingency may also be referred to as the 'ABC' contingency', where ABC is an acronym for antecedent, behaviour and consequence. The following is an example of an ABC contingency: an adult holds up a toy car, the child looks at the adult and says "car", the adult hands the car to the child. In this example, the adult holding up the car is the antecedent, the child looking at the adult and saying "car" is the behaviour and the child receiving the car to play with is the consequence.

Much of the work that Skinner did to illustrate the three parts of this contingency is still relevant to behavioural interventions today. For example, in reference to his research with rats and pigeons, Skinner (1953) noted " If we arrange our apparatus so that a small amount of food is presented immediately after a selected response is made, we observe an immediate increase in the frequency of that response" (p.71). Using a favourable outcome to increase the frequency of a desired behaviour, as described by Skinner in the example above, is referred to as positive reinforcement and is typically a core element of behavioural approaches to intervention (Roane, Fisher, & Carr, 2016).

Other examples of principles commonly used in behavioural interventions include modelling, prompting and shaping (Roane, Fisher & Carr, 2016). Modelling is when a target behaviour is demonstrated for a learner to imitate, such as when an adult models clapping their hands for a child to copy. Prompting is a tool that is used to minimise learner error by increasing the chances of a correct response (and subsequent access to reinforcement). Prompting may involve using additional cues to make the discriminative stimulus clearer, for

example, using a visual alongside a verbal instruction to show a child when it is snack time. Prompting may also be used to support the child in performing the target behaviour, such as when an adult gently lifts a child's elbow to encourage them to wave. Finally, shaping is used to help teach new behaviours. With shaping, a child's existing behaviour is slowly shaped towards the target behaviour through reinforcement of successive attempts at the target behaviour. For example, shaping may be used to teach a child to use the word 'ball' to request play with a ball. In this example, the child may initially receive the ball after making any vocalisation, then once the child is consistently using a vocalisation, they may only receive the ball when they use the sound "bb" to request it, and finally, they will only receive the ball when they use the word "ball" to request it.

One of the earliest published ASD intervention studies evaluated the impact of operant reinforcement techniques on the behaviour of three children with ASD (Ferster & Demyer, 1962). The study demonstrated that the principles of operant conditioning and reinforcement could be used to change and shape the behaviours of individuals with ASD. Prior to this, operant conditioning had been used primarily with typically developing children. The Ferster et al. study, and subsequent similar studies, paved the way for the development of ABA as a "credible treatment and assessment technology" (Matson & Neal, 2009, p.7). As ABA-based research evolved, studies (e.g. Wolf, Risley, & Mees, 1964) began to demonstrate the value of ABA in treating multiple behaviours associated with ASD, rather than just the specific behaviours targeted in earlier studies (Matson & Neal, 2009).

The use of ABA to target multiple behaviours in young children with ASD is now closely associated with the late Ole Ivar Lovaas (Matson & Neal, 2009). In 1987, Lovaas published what is now considered to be a landmark study in the field of EI for ASD. In this study, ABA techniques, delivered using a discrete trial teaching (DTT) format, were used to teach children skills such as attending, imitating, matching, and complying with basic directions. DTT includes the following elements: (a) skills are isolated and taught one at a time (hence the name 'discrete') via brief, repeated learning trials, (b) teaching occurs in an environment where unnecessary details are minimised and (c) child progress is assessed and monitored via ongoing data collection and analysis (Roane, Fisher, & Carr, 2016).

Lovaas (1987) used a quasi-experimental multiple-group comparison design to evaluate the impact of the intervention on the IQ, adaptive skills and levels of maladaptive behaviour of 38 young children (aged < 46 months) with ASD. Results indicated that experimental group participants, who received 40+ hours of intervention per week over at least 2 years, showed significantly greater improvement than control group participants, who

received 10 hours or less of intervention per week for at least two years. A key finding from this study was that by the age of 6 or 7, almost half of the participants from the experimental group achieved intelligence scores in the normal range and were able to participate in mainstream schooling without need for additional support. This had major implications for attitudes and expectations regarding the education and treatment of individuals with ASD because at the time the study was published, there was still a view that most individuals with ASD were 'unteachable' and should be institutionalised.

Individual comprehensive ABA interventions for ASD, such as the one used by Lovaas (1987), are now commonly referred to as Early Intensive Behavioural Intervention (EIBI; Wong et al., 2015). Since Lovaas et al.'s original EIBI study, other EIBIs have been developed that vary according to the specific settings, intervention agents and intervention intensities that they recommend. However, all EIBI interventions contain the same core elements of the EIBI described in the Lovaas study (Matson & Neal, 2009), such as the use of DTT and behavioural teaching procedures.

Following the astonishing results reported by Lovaas (1987), a number of replication studies have been published and these have generally demonstrated positive outcomes for children receiving EIBI (e.g. Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2007; Eldevik, Hastings, Jahr, & Hughes, 2012; Peters-Scheffer, Didden, Mulders, & Korzilius, 2010). Birnbrauer and Leach (1993), for example, replicated the Lovaas (1987) intervention and reported gains approaching "normal levels of functioning" for four of the nine children receiving the intervention. However, they also noted significant gains in one of the five control group children, suggesting a possible maturation effect. Today, EIBI continues to be widely used in clinical settings in many countries (Sandbank et al., 2019).

In the field of EI for ASD, interventions based upon a behavioural model have been the most widely studied (Reichow, 2012) and appear to have the largest base of supporting evidence (Vismara & Rogers, 2010). Indeed, comprehensive individual behavioural interventions are considered to be one of only several intervention approaches with a 'well-established' evidence base (Wong et al., 2015). However, several authors have questioned the rigor of this evidence (Wong et al., 2015). For example, in a recent review and meta-analysis of the ASD early intervention literature (Sandbank et al., 2019), authors concluded that the evidence base for behavioural interventions requires strengthening. Specifically, the authors suggested that more randomised controlled trials, that include child outcome measures other than caregiver report, are required.

Developmental/Relationship Focussed Interventions

Developmental interventions are a group of interventions that are drawn from developmental theory (Schreibman et al., 2015). They are sometimes referred to as 'relationship focussed' because of the importance that is placed on interaction and the formation of relationships with others (Sandbank et al., 2019). Examples of developmental interventions include DIR/Floortime™ (Greenspan & Wieder, 2007), the Denver model (Rogers et al., 1986), the Preschool Autism Communication Trial (PACT; Green et al., 2010) and the Hanen model (Carter et al., 2011).

From a developmental perspective, ASD is viewed as a disruption to the social interactions that form the primary context for social and language learning (Sandbank et al., 2019). Developmental interventions therefore focus on improving the quality of relationships and interactions between the child with ASD and adults/peers with a view that these relationships and interactions can be used to support the child in developing a range of different skills (Sandbank, 2019). Delivery of developmental interventions typically occurs in a child's natural environment within everyday routines and interactions (Sandbank et al., 2019). This contrasts with EIBI where the learning environment is typically simplified and carefully structured (Schreibman et al., 2015).

Developmental interventions draw on the work of constructivist theorists such as Piaget (1952), Bruner (1978) and Vygotsky (1962). Constructivism derives its name from the supposition that all learning is constructed. From this perspective, children are understood to construct their own learning through exploring their surroundings (Sandbank et al., 2019) and thus need to be active participants in their own learning (Schreibman et al., 2015). Play is also recognised as an integral part of early learning, especially in the areas of social and language development, problem solving, adaptive behaviour and cognition (Boutot, Guenther, & Crozier, 2005). Child development is seen to follow a regular, predictable pattern and optimal learning occurs when tasks are set at the next step in a child's developmental sequence, just beyond what they are currently doing (Schreibman et al., 2015). Linked to this is the concept of 'scaffolding' (Vygotsky, 1962), which represents support provided by an adult/peer to enable a child to complete a task that is just beyond what they can do independently. Finally, from a developmental perspective, optimal learning occurs within social interactions that involve genuine positive affect and where both partners take active turns in the interaction (Sandbank et al., 2019). 'Joint activity routines' (Ratner & Bruner, 1978), which refer to the format of typical child-parent social exchanges in early

childhood, are often used as an interactive format for teaching new skills and supporting child development.

The effectiveness of the developmental approach to intervention is supported by a number of empirical studies (Sandbank et al., 2019), including several randomised controlled trials (e.g. Green et al., 2010). Collectively, results suggest that developmental interventions may be especially effective for supporting social communication development in young children with ASD (Sandbank et al., 2019). However, gains made in social communication do not appear to translate to gains in overall language development for children receiving developmental intervention (Sandbank et al., 2019).

Naturalistic Instructional Approach

Interventions that follow a naturalistic instructional (NI) approach (also referred to as naturalistic teaching strategies) are delivered in a child's natural environment by individuals who are typically present and interacting with the child in that environment (Mrachko & Kaczmarek, 2017; Rule et al., 1998; Snyder et al., 2015). Interventions following the NI approach share several common characteristics as described below. Firstly, NI approaches make use of 'embedded learning opportunities' (Snyder et al., 2015). This means that interventionists provide intentional and systematic instruction and opportunities for learning within naturally occurring activities, routines and interactions (Lane, Lieberman-Betz, & Gast, 2016). Secondly, NI interventions support the development of behaviours and skills that are functional (Snyder et al., 2015) and socially valid (Shepley et al., 2018). In other words, NI interventions target the skills and/or behaviours that the child needs to function and fully participate in the environment where intervention occurs (Snyder et al., 2015). Thirdly, in NI interventions, interventionists make use of natural or logical reinforcers (Snyder et al., 2015). For example, an adult may provide a requested toy as a natural reinforcer for the child's verbal request for that toy. Finally, activities are child-centred (Shepley et al., 2018) this means that they are either child-initiated or initiated by an adult in response to the child's motivation, interest and/or attention (Snyder et al., 2015).

Although NI approaches are sometimes presented as a distinct class of intervention (e.g. Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Snyder et al., 2015), there appears to be significant overlap between NI and behavioural and/or developmental approaches. Specifically, many NI interventions employ behaviourally-based instructional techniques (Dubin & Lieberman-Betz, 2019), these interventions may be referred to as naturalistic behavioural interventions (Schreibman et al., 2015). This type of intervention typically involves a three-term contingency where a learning opportunity is embedded in a naturally

occurring activity, a target behaviour or approximation is prompted and a natural or logical consequence is provided as a reinforcer (Snyder et al., 2015). NI interventions also appear to align well with developmental approaches as they incorporate developmentally-appropriate practices such as play-based learning and a focus on social interaction (Dubin & Lieberman-Betz, 2019).

Specific instructional techniques that are often utilised under the NI approach include the use of planned environmental arrangements, which involve modifying the learning environment, materials and/or activity to create a learning opportunity (Snyder et al., 2015). For example, a teacher may place a puzzle piece out of reach to create an opportunity for the child to use a reach to request during a puzzle activity. NI approaches may also involve peers in the delivery/mediation of the intervention or make use of other instructional techniques such as the provision of visual support (Snyder et al., 2015).

NI approaches might be particularly well suited to inclusive preschool settings (Rule et al., 1998) because they allow teachers to provide individualised instruction within typical preschool activities and routines to support children to fully participate in the regular preschool curriculum (Snyder et al., 2015). NI interventions also comply with current recommendations that young children should receive intervention in a play-based format involving age-appropriate materials and typical play settings (Division for Early Childhood of the Council for Exceptional Children, 2014).

Naturalistic interventions are classed as an evidence-based practice (National Autism Center, 2015; Odom, Collet-Klingenberg et al., 2010) and there is evidence to suggest that the NI approach can be effective in supporting the development of social and communicative skills (Odom, Collet-Klingenberg et al., 2010; Rule et al., 1998; White et al. 2011; Wong et al., 2015) and promoting general skill acquisition (Snyder et al., 2015) in young children with ASD. For example, a recent literature review (Snyder et al., 2015) of NI interventions for young children with developmental disabilities (including ASD) reported positive outcomes for 207 of the 211 young children across the 43 included studies. A range of different child skills were targeted across studies including pre-academic, motor, communicative, cognitive, social and adaptive behaviour. Results regarding the generalisation and maintenance of child behaviours were also promising. For the children who had these variables measured, 92% demonstrated maintenance and 94% demonstrated some degree of generalisation. However, less than half of the included studies reported on maintenance and/or generalisation so these findings should be interpreted with caution (Snyder et al., 2015).

Naturalistic Developmental Behavioural Interventions

Behavioural and developmental approaches to ASD are often presented in contrast to one another (Sandbank et al., 2019). However, they are not necessarily mutually exclusive, and some intervention approaches incorporate elements of both approaches along with NI techniques. Interventions that follow this approach are referred to as naturalistic developmental behavioural interventions (NDBI; Schreibman et al., 2015). Examples of NDBIs include the Early Start Denver Model (ESDM; Rogers & Dawson, 2010); Enhanced Milieu Teaching (EMT; Kaiser, 1993), Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER; Kasari, Freeman, & Paparella, 2006; Kasari, Gulsrud, Wong, Kwon, & Locke, 2010) and Project ImPACT (Ingersoll, Dvortcsak, Whalen, & Sikora, 2005; Ingersoll & Wainer, 2013). While the specific procedures of different NDBI approaches may vary, all focus on using behavioural principles to teach developmentally appropriate skills within a child's natural environment (Sandbank et al., 2019).

Specific behavioural teaching procedures that are typically included in NDBIs include the use of a three-term contingency, modelling, prompting, measurable teaching goals and the systematic monitoring of child progress via regular data collection. However, different models vary according to the specific way in which each of these procedures is used (Schreibman et al., 2015). Likewise, NDBIs share a number of common elements drawn from the developmental approach, but the way in which these are incorporated tends to vary across different interventions. Examples of common NDBI procedures with a developmental basis include the use of developmentally-appropriate goals that target the expected next step in a child's learning (Schreibman et al., 2015), an emphasis on socially rewarding activities and interactions that involve turn-taking and shared control (Sandbank et al., 2019). NDBIs may also include procedures that are drawn from NI such as the use of play-based teaching with embedded learning opportunities, child-centred learning and natural reinforcers (Snyder et al., 2015).

NDBIs represent a relatively new approach to EI for ASD (Schreibman et al., 2015) but the efficacy of this approach is already supported by a growing body of evidence (e.g. Dawson et al., 2010; Ingersoll & Wainer, 2013; Koegel, Bradshaw, Ashbaugh, & Koegel, 2014). Indeed, it is suggested that "currently, therapist-delivered, comprehensive, high-intensity EIBIs that incorporate naturalistic and developmental principles are considered the most efficacious approaches for improving outcomes for young children with ASD" (Estes et al., 2019, p.1).

Summary of Different Theoretical Approaches to Early Intervention

There are currently no empirical studies that directly compare the effectiveness of behavioural, developmental, NI and NDBI approaches to intervention. However, a recent meta-analysis (Sandbank et al., 2019) evaluated and compared the evidence for a range of different approaches including behavioural, developmental and NDBI. The analysis included studies that used a quasi-experimental or experimental design to evaluate a non-pharmacological intervention for young children with ASD. Effect sizes from 130 different studies representing 6,240 participants were analysed, with significant positive effect sizes reported for social communication outcomes for behavioural, developmental and NDBI approaches to intervention. For NDBI and behavioural approaches, significant positive effects were also found for language and play skill outcomes. For behavioural approaches, significant positive effect sizes were also found for outcomes related to adaptive behaviour, cognition, motor skills, social-emotional development/challenging behaviour, and ASD symptoms/severity. However, when the authors excluded outcomes measured via parental report from their analysis, only developmental and NDBI intervention approaches produced significant positive effect sizes. Further, the authors concluded that NDBIs are the intervention approach that is best supported by evidence produced from randomised controlled trials (RCTs). RCTs are considered to be the 'gold standard' research design and are important for establishing a cause and effect relationship between an intervention and child outcomes (Kasari, 2002).

The Early Start Denver Model

The studies in this thesis will evaluate the use of the Early Start Denver Model (ESDM), a comprehensive NDBI (Rogers & Dawson, 2010). The model draws on earlier work from the Denver model (Rogers, Herbison, Lewis, Pantone, & Reis, 1986; Rogers & DiLalla, 1991) and Pivotal Response Training (PRT; Koegel, Koegel, Harrower & Carter, 1999) and incorporates behavioural and developmental theories. It is designed for use with children aged between 12 and 60 months and can be used in one-on-one or group-teaching formats.

The ESDM intervention is manualized and based upon a comprehensive curriculum that covers expressive and receptive communication, social skills, imitation, gross and fine motor skills, behaviour, self-care and cognition (Rogers & Dawson, 2010). A curriculum checklist is used to assess a child's current level of skill in each domain and to plan learning objectives and teaching steps. In line with Vygotsky's zone of proximal development

(Vygotsky, 1978), objectives are set just beyond the child's current level of ability and teaching activities are designed to scaffold child progress towards the next step.

The ESDM aims to "enhance the reward value of social interaction" for children with ASD (Rogers & Dawson, 2010, p.25), so the establishment of positive affect between child and adult and shared control and turn taking are strongly emphasised. The ESDM also builds upon the recognized role of child motivation in learning (Koegel, Koegel, & McNerney, 2001; Koegel & Mentis, 1985) and uses child-centered play interactions to optimise child motivation. Behavioural teaching techniques permeate the model, with therapists expected to demonstrate high levels of correct implementation of these techniques in their therapeutic interactions with the child. Examples of the techniques used include providing clear cues, using least-to-most response prompting, provision of positive reinforcement, and the interspersing of instruction on skills already mastered (i.e., maintenance instruction) with instruction on skills that are still in the acquisition phase.

The ESDM is designed for use in a child's everyday routines and environment so can be delivered across a range of settings and formats by a range of different delivery agents. For example, parents, teachers, therapists and other professionals can deliver ESDM in one-to-one or small group-based formats in the home, clinic or preschool. Multiple studies have documented improved outcomes for children receiving ESDM therapy delivered across a range of intervention settings and by a range of intervention agents. However, at present there is not enough evidence for the ESDM to be considered an evidence-based practice (Baril & Humphreys, 2017; Waddington, van der Meer, & Sigafoos, 2016). The current studies will focus on group-based ESDM because group-based delivery of EI seems well-suited to the NZ context (see the following sections for more detail) and there is a need for more community-based studies of group-based ESDM (Capes et al., 2019).

Group-based ESDM

ESDM can be delivered in any environment where an adult and young child with ASD are interacting (Rogers & Dawson, 2010). Whilst traditional ESDM can be implemented in a small group format (Rogers & Dawson, 2010), the group-based ESDM manual (G-ESDM; Vivanti, Duncan, Dawson, & Rogers, 2017) provides specific information regarding group-based delivery. The G-ESDM programme is based upon the same core principles and strategies as traditional ESDM, and both approaches use the same curriculum checklist, teaching techniques and core fidelity items. However, the G-ESDM also includes a specific focus on the following aspects of group-based delivery: (a) classroom layout, (b) scheduling of daily activities and routines, (c) teaching team roles and responsibilities and (d)

the encouragement and management of peer interactions. The G-ESDM manual also specifies how individual children's teaching goals can be targeted within small and large group activities, as well as during one-to-one interactions.

In G-ESDM, teaching goals are targeted during play activities and naturalistic classroom routines such as snack time or group song routines. Objects and activities are selected to match child interests (Vivanti et al., 2017). The G-ESDM can be used in a range of different group settings including designated ASD preschools (where all children have a diagnosis of ASD) or inclusive preschools (where most children do not have a diagnosis of ASD). The recommended teacher-child ratio for delivering G-ESDM is 1:3 or 1:4 (Vivanti et al., 2017).

Studies Evaluating the G-ESDM

To date, four studies have evaluated the impact of the G-ESDM on child outcomes (Eapen et al., 2013; Fulton et al., 2014; Vinen, Clark, Paynter, & Dissanayake, 2018; Vivanti et al., 2014), a further two studies (Vivanti et al., 2013; Vivanti et al., 2016) sought to identify predictors of treatment outcome but also included data on treatment effectiveness, and a final study (Vivanti et al., 2018) compared outcomes of children with ASD who received ESDM in an inclusive preschool with those who received ESDM in a specialist ASD preschool. A further study (Contaldo, Colombi, Pierotti, Masoni, & Muratori, 2019), evaluated skill acquisition and treatment predictors for 32 children receiving a treatment package consisting of individual and group-based ESDM therapy. Three participants received only individual therapy (not G-ESDM) and their results could not be separated out from the participants who did receive G-ESDM therapy, so this study is not included in the following summary of G-ESDM research.

In each of the seven G-ESDM studies, participating children received 15 -25 hours per week of G-ESDM therapy at designated ESDM preschools with adult:child ratios of 1:3 (Vinen et al., 2018; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016) or 1:4 (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2018). In two studies (Eapen et al., 2013; Fulton et al., 2014) participants also received an additional hour of one-on-one ESDM therapy per week. Parents from five studies (Eapen et al., 2013; Vinen et al., 2018; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016) were also offered regular information sessions on the ESDM strategies and encouraged to use these strategies at home with their child.

All studies were set in Australia with five studies (Eapen et al., 2013; Fulton et al., 2014; Vinen et al., 2018; Vivanti et al., 2013; Vivanti et al., 2014) based at government-

funded Autism Specific Early Learning Care Centres (ASELCCs) and the remaining studies (Vinen et al., 2018; Vivanti et al., 2018) based at La Trobe University's Community Children's Centre. The Vivanti et al. (2018) study was the only study to evaluate G-ESDM delivery in an inclusive preschool, the remaining six studies were set in ASD-specific preschools. For six of the studies (Eapen et al., 2013; Fulton et al., 2014; Vinen et al., 2018; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016), intervention was delivered by teams of certified ESDM therapists, often including a range of professionals such as early childhood teachers, speech and language therapists, occupational therapists and psychologists. In the remaining study (Vivanti et al., 2018), each preschool had at least one certified therapist and remaining staff members attended ESDM training workshops and received ongoing coaching and supervision from certified ESDM therapists throughout the study.

Across these studies, the G-ESDM was associated with improvements in child cognitive skills (Eapen et al., 2013; Fulton et al., 2014; Vinen et al., 2018; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2018), adaptive behaviour (Vivanti et al., 2016; Vivanti et al., 2018), various language/communication outcomes (Eapen et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016; Vivanti et al., 2018), gross motor skills (Eapen et al., 2013), and reduced levels of challenging behaviour (Fulton et al., 2014). Two studies (Eapen et al., 2013; Vivanti et al., 2018) also reported a significant decrease in participants' autism symptoms however, four studies (Fulton et al., 2014; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016) reported no significant change in autism severity/symptoms and one study (Vinen et al., 2018) reported an increase. The authors of this study suggested that the increase may have been due to higher levels of restricted/repetitive behaviours in participating children. Collectively, the results from these studies highlight the potential effectiveness of the ESDM delivered in a group setting.

It is important to note however, the absence of a control group who did not receive ESDM for most of the aforementioned studies (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2013; Vivanti et al., 2016; Vivanti et al., 2018). Thus, findings should be interpreted with caution. Further, in the two studies (Vinen et al., 2018; Vivanti et al., 2014) that did include a control group, the authors did not provide a detailed description of the intervention received by the control group. This limits our ability to draw conclusions regarding the effectiveness of G-ESDM in comparison to treatment-as-usual.

In terms of treatment outcome predictors, Vivanti et al. (2016) found that child age was predictive of gains in some outcomes but not others. Specifically, children who were

aged 18 – 48 months made greater gains on a measure of verbal developmental quotient (DQ) but not on measures of non-verbal DQ, adaptive behaviour or ASD symptom severity. The authors concluded that starting intervention early may be particularly important for the development of verbal skills but may not be as important for other outcomes. Vivanti et al. (2013) found that children with advanced skills in functional use of objects, imitation and understanding of others' goal-directed actions with objects appeared to make greater gains in verbal and non-verbal cognition. However, their results did not indicate a relation between treatment outcomes and social attention abilities, chronological age, developmental age or number of treatment hours (each child received at least 15-hours per week).

The study by Vivanti et al. (2018) is of particular relevance to the studies in this thesis because, to the author's knowledge, it is the only study that includes inclusive-preschool based delivery of the G-ESDM. In this study, outcomes of children with ASD who received ESDM in an inclusive preschool were compared with those of children who received ESDM in a specialist ASD preschool. Participants from both groups demonstrated improvements across a range of outcomes including language/communication, social interaction, imitation, adaptive behaviour and ASD symptoms. There did not appear to be any significant difference between inclusive versus specialised delivery in terms of child improvements. The authors concluded that inclusive preschool-based delivery of ESDM is a feasible and potentially effective approach to early intervention for young children with ASD.

The New Zealand Context

The effectiveness of G-ESDM has been established in a number of Australian-based studies where intervention was implemented in designated ESDM preschools for 15-25 hours per week with child-teacher ratios of 3:1 or 4:1. However, preschools in other countries are likely to be governed by different legislation (e.g. regarding funding for resources and child-teacher ratios) which may impact upon the feasibility of using this model of intervention (Vivanti et al., 2014). Thus, the following section presents an overview of the New Zealand EI and early childhood education (ECE) contexts where the present research is set.

Early Intervention for ASD in New Zealand

There is very little available literature regarding the nature of EI for young children with ASD in New Zealand. However, a recent survey of 64 parents of young children with ASD (Kasilingam, Waddington, & van der Meer, 2019) found that children received an average of 8.7 hours of EI per month, this was, on average, 37 hours per month less than what parents indicated they would like their child to be receiving. These findings suggest that

young children with ASD in New Zealand may be receiving significantly fewer hours of intervention than their parents desire.

Families in New Zealand are required to fund intensive EI themselves as there is no national disability insurance scheme and the government does not currently provide funding for intensive intervention (Ministry of Social Development, 2019). This may explain why over 90% of the families surveyed by Kasilingam et al. reported that their child received less than ~~the~~ 60-100 hours per month of intervention. ~~that is recommended by the New Zealand government (Ministries of Health and Education, 2016)~~. Parents who are caring for a child with ASD are entitled to a 'child disability allowance' of $48.45 per week from the government (Ministry of Social Development, 2019). However, for many forms of privately-accessed EI, this amount may not even cover the cost of a single hour of therapy. The government also funds behavioural support for "people with an intellectual disability whose behaviour makes it difficult for them to engage in everyday routines, settings, activities and relationships" (Ministry of Health, 2018, para 2). This is provided by a non-governmental organisation and involves support for the individual and their family in formulating and implementing a behaviour management plan to deal with specific behaviour(s).

Children with ASD who attend preschool may also receive support through the Ministry of Education. Results from the aforementioned survey (Kasilingam et al., 2019) indicated that most children attended early childhood education (ECE) for at least 15-hours per week and around 40% of children received some type of EI from a teacher or education support worker. It therefore seems important to consider the New Zealand ECE context in relation to the delivery of EI for young children with ASD.

The New Zealand ECE Context

In New Zealand, the term ECE is used to refer to a wide range of educational services that cater for children under the age of 5 (Tyler-Merrick et al., 2018). Services may be teacher-led, parent-led or whānau-led and may be owned and run by non-profit community groups or private or corporate entities. Under the New Zealand system, no distinction is made between education and care, instead, these concepts are integrated (Tyler-Merrick et al., 2018). Although ECE is not compulsory in New Zealand, it is accessed by most children before they enter school. For example, 96.7% of all children entering school during 2016 had previously attended an ECE service (Education Counts, 2019).

ECE providers may vary according to their philosophical approach to ECE delivery (Tyler-Merrick et al., 2018), however, all are required to follow the set of principles, aims and goals laid out in the national ECE curriculum, Te Whāriki (Ministry of Education,

1996b). Te Whāriki is a Māori name that can be translated as ‘a mat for all to stand on’ (May & Carr, 1997) which encapsulates the inclusive intent of the document. Indeed, the New Zealand education system places a strong emphasis on inclusion. In 1989, the Education Act was amended to provide the right for all children, regardless of ability, to be able to receive an education at their local school. Later policies, such as Special Education 2000 (Ministry of Education, 1996a) and Success for All. Every School. Every Child (Ministry of Education n.d.) reiterated the government’s commitment to providing a fully inclusive education system for all New Zealanders. Thus, many New Zealand children with learning support needs (including children with ASD) attend inclusive preschools.

The need for additional supports, or special education provisions, for children with diverse learning needs is also acknowledged (Te Kete Ipurangi, n.d.). Provisions for additional resources for these learners are laid out in Special Education 2000 (Ministry of Education, 1996a) and provided through the Ministry of Education, Learning Support (Formerly Group Special Education; Shuker & Cherrington, 2016). This multi-disciplinary team involves early intervention teachers, education support workers, kaitakawaenga (Māori cultural advisors), psychologists and speech-language therapists who work together with the child’s teachers and family to develop and implement a support plan for children with special learning needs (Ministry of Education, 2019). According to Shuker & Cherrington (2016), Learning Support provides EI to approximately four percent of New Zealand children under the age of five.

While New Zealand legislation provides for the inclusion of all children in ECE, the practical implementation of true inclusion is not necessarily straightforward. For example, New Zealand preschools cite high child-teacher ratios as one of the main barriers to supporting children with special learning needs (Education Review Office, 2012). Indeed, ratios may legally be as high as 15:1 in some circumstances (Education (Early Childhood Services) Regulations, 2008). Higher ratios are likely to mean that teachers have less time to dedicate to one-on-one and small group teaching which is likely to be important for children with ASD.

In summary, effective EI can significantly improve outcomes for young children with ASD. NDBIs represent one approach to EI and there is a growing body of evidence supporting their efficacy. ESDM is a promising NDBI that can be delivered across a range of different settings by a range of different delivery agents. The delivery of the ESDM to more than one child at a time is referred to as G-ESDM and there is a growing body of evidence supporting the efficacy of this approach. The G-ESDM approach seems particularly well-

suited to delivery in a New Zealand context as it may allow for delivery in a preschool context and many New Zealand children already attend such settings. Chapter 2 provides a rationale for the delivery of EI in an inclusive preschool setting along with a systematic review of the literature on teacher-delivered EI in this type of setting.

CHAPTER 2
RATIONALE FOR THE PRESENT RESEARCH

Chapter Note

The section in this chapter titled "Literature on teacher-delivered EI in an inclusive preschool setting" has been previously published as a literature review in the *Review Journal of Autism and Developmental Disorders*. Page 5 provides the full citation details for this published literature review. Dr. Larah van der Meer provided input into design, data analysis and editing and performed IOA checks, Dr. Hannah Waddington provided editing and Professor Jeff Sigafoos assisted with design and editing. Aside from this input, this review was designed and conducted by me.

The original published review is included in its entirety and only minor grammatical changes have been made. For example, spelling has been changed from American to New Zealand English.

Inclusive Preschool-based Delivery of Early Intervention

Inclusive preschools appear to offer a logical setting for community-based delivery of early intervention (EI) as young children with autism spectrum disorder (ASD) may already attend an inclusive preschool. Delivering EI in a setting that families are already accessing, such as an inclusive preschool, may help to broaden the reach of EI to communities that are typically underserved, which is an international priority in the field of ASD research (Pellicano et al., 2018). Furthermore, there is an increasing focus on the use of more naturalistic approaches to EI, especially naturalistic developmental behavioural interventions (NDBIs; Tiede & Walton, 2019), and it makes sense to evaluate such interventions in a child's natural environment.

Preschool-based delivery of EI would seem to offer a number of potential advantages over traditional clinic-based delivery. From a pragmatic perspective, implementation in a preschool setting is likely to be more efficient than traditional one-on-one delivery as it allows for delivery to more than one child at a time (Leaf et al., 2018). Further, in a community-based preschool setting, there is the potential for existing resources such as preschool teaching staff, play materials and equipment to be used in the delivery of the intervention, leading to likely cost savings. These cost savings may be passed on to the families of children receiving the intervention, potentially helping to lessen the financial burden that is commonly faced by families accessing EI (Nahmias, Pellecchia, Stahmer, & Mandell, 2019). Also, parents are not typically required to be physically present while their

child receives intervention at preschool, this may help to lessen the time burden associated with accessing services for ASD.

Inclusive preschool-based delivery would also seem to satisfy legal and ethical requirements regarding the education of children with disabilities. Specifically, it is recommended that children with disabilities (including those with ASD) should receive EI in their natural environment, with the least amount of restriction required to meet the child's needs (Broderick, 2017; Ledford & Wolery, 2011; United Nations, 2006). In addition, there is a legal imperative for the provision of intervention in an environment with ongoing opportunities to interact with typically developing peers (Broderick, 2017; United Nations, 2006). Inclusive preschool environments would appear to satisfy these recommendation as they offer a natural environment with access to typically developing peers.

There may also be educational advantages associated with inclusive-preschool based delivery, especially in supporting the development of social and communicative behaviours in young children with ASD. This would seem to be important given that a core feature of ASD is difficulty in social communication. The presence of typically developing peers in an inclusive environment may provide young children with ASD with opportunities for observing and practicing appropriate communicative and social behaviours (Koegel, Koegel, Frea, & Fredeen, 2001; Vivanti, Duncan, Dawson, & Rogers, 2017). Typically developing peers may also provide cues and reinforcement for social interaction (Smith, Lovaas, & Lovaas, 2002). Inclusive preschools may also more closely resemble the school setting than specialised preschools or clinical settings and may therefore provide children with ASD with opportunities to practice interacting and learning in the type of group settings that they are likely to encounter at school.

Preschool Teachers as Interventionists

Preschool teachers would seem to be well-suited to implementing interventions because, like parents, they spend a great deal of time working directly with young children with ASD (Sandbank et al., 2019). As a result, they are likely to understand the unique needs and interests of the children that they teach (Lawton & Kasari, 2012). Teachers may also have useful specialised knowledge of early development and teaching and learning. Further, when teachers deliver EI, there is less need for outside specialists. This may help to enhance the long-term sustainability of the intervention and may also help to address the long wait-times associated with the shortage of ASD specialists in many communities.

It is important to note however, that teachers require a thorough understanding of ASD and its impact on learning, as well as knowledge of specific teaching strategies in order

to effectively include learners with ASD (Baines & Yates, 2018). Some research suggests that typical pre-service training may not equip teachers with this knowledge and understanding (Mitchell, & Hegde, 2007; Sanz-Cervera et al., 2017) and teachers often want to increase their knowledge and skill in this area (Barned et al., 2011). Thus, teachers may require further training to be able to effectively support children with ASD in an inclusive preschool environment.

Coaching Preschool Teachers to Deliver Interventions

There are a range of different approaches for training in-service teachers. Traditionally, approaches have tended to emphasise didactic teaching methods, offsite workshops and conferences. However, these approaches may be better suited to increasing teachers' awareness of different teaching practices, rather than their use of them (Artman-Meeker et al., 2015). On the other hand, research suggests that "on the job" learning, where teachers learn and practice new skills in the classroom environment, can contribute to long-term changes in teaching practice (Elek & Page, 2019). There is also evidence to suggest that high quality early childhood education (ECE) teaching practices are linked with better child outcomes (Egert et al., 2018), so teacher training approaches that use in vivo learning and practice to improve teaching practice appear to be gaining traction.

One such method is teacher coaching. Teacher coaching appears to be an increasingly used approach for in-service training (Elek & Page, 2019). There is no one agreed upon definition for teacher coaching, but all definitions tend to include the following ideas: (a) coaching is a partnership; (b) coaching should help teachers to learn and sustain best practice; (c) coaching sessions should include observation, reflection, conversation, and problem solving between the coach and the teacher; and (d) coaching should focus on building the teacher's capability (McLeod, Hardy & Grifenhagen, 2018).

A number of studies have demonstrated that effective coaching can lead to changes in ECE teachers' practice and can help teachers to support children's learning and development in a range of different areas (e.g. Knoche, Kuhn, & Eum, 2013; McLeod et al., 2018). For example, in a randomized-controlled trial (RCT) involving 304 ECE teachers, Neuman and Cunningham (2009) found that teachers' use of evidence-based language and literacy teaching practices increased as a result of their participation in a coaching and coursework programme. Importantly, Neuman and Cunningham found that teachers who received both coaching and coursework showed significantly greater improvement in their teaching practice than teachers who received only the coursework portion of the programme, and teachers in the control group. Coaching may also be important in supporting ECE teachers to use

evidence-based practices in the classroom. Indeed, Artman-Meeker et al. (2015) suggested that coaching can support teachers' fidelity in using evidence-based practices and is crucial to the long-term sustainability of evidence-based practices in preschool classrooms.

Although there is growing evidence to support the effectiveness of coaching in changing ECE teachers' practice and supporting teachers with the implementation of evidence-based practices in the ECE environment, there appears to be a paucity of data related to the social validity of coaching programmes for ECE teachers. For example, in their review of the quantitative ECE teacher coaching literature, Artman-Meeker et al. (2015) reported that only 30% of the 49 studies in their review included a measure of social validity. The 15 studies that did report on social validity suggested that teachers rated the coaching programmes favourably, indicating that the coaching programmes were socially valid. In a separate qualitative study, Knoche et al. (2013) explored the perspectives of 21 preschool teachers, childcare workers and parents who had participated in a coaching programme and found that respondents generally perceived the programme positively. Thus, it appears that coaching may be a socially valid approach to training ECE teachers, however further research on teachers' perceptions of coaching is needed. Such research is likely to be important to the success of coaching programmes because changes in teaching practice appear to be closely linked to teachers' satisfaction with the coaching relationship and processes (Diamond, & Powell, 2011; Twigg et al., 2013).

Literature Review on Teacher-Delivered EI in an Inclusive Preschool Setting

Abstract

Early intervention is widely recommended for young children with autism spectrum disorder, but the effectiveness of interventions when implemented in inclusive preschool settings needs to be considered. To this end, we identified 16 studies that provided early intervention to children with autism spectrum disorder who were attending inclusive preschools. Effectiveness studies, that is studies evaluating interventions that were implemented under real world conditions, were targeted provided they met the pre-determined inclusion criteria. Included studies were summarised in terms of (a) participant characteristics, (b) intervention procedures, (c) procedures for training teachers, (d) study design, (e) outcomes, (f) study quality, and (g) social validity. A range of intervention procedures were implemented and positive outcomes for children and/or teachers were reported in most studies. However, methodological limitations were identified for most of the included studies, indicating the need for additional higher-quality research. Still, the present review suggests that teachers

may be able to effectively deliver early intervention to young children with autism spectrum disorder in inclusive preschool settings.

Preschool Interventions for Children with Autism Spectrum Disorder: A Review of Effectiveness Studies[2]

Autism spectrum disorder (ASD) is a type of developmental disability characterized by deficits in social interaction and communication skills and by the presence of repetitive/ritualistic behaviours and a restricted range of interests (American Psychiatric Association, 2013). Although ASD was once considered to be a relatively rare condition (Simpson, 2004), its prevalence is now estimated at up to 1 in every 59 individuals (Baio et al., 2018). With increasing numbers of children being diagnosed with ASD, there is a corresponding need for provision of effective intervention (Woods & Wetherby, 2003). Various intervention approaches have been developed and evaluated to assess their efficacy and/or effectiveness for promoting improved adaptive behaviour functioning and reducing ASD symptoms. Efficacy research refers to the evaluation of intervention effects when the intervention is conducted under ideal or controlled conditions, such as when delivered by researchers in a clinical setting. In contrast, effectiveness research refers to the evaluation of intervention effects when the intervention is conducted under real world conditions, such as when delivered in preschool settings by the usual teaching personnel (Singal, Higgins, & Waljee, 2014).

The range of interventions that have been evaluated in efficacy or effectiveness research include pharmacological agents, dietary interventions, occupational and speech-language therapies, interventions based on the principles of applied behaviour analysis, and developmentally-orientated interventions (Ospina et al., 2008). In addition, hybrid intervention approaches have been evaluated, such as early intervention programmes that make use of behaviour analytic instructional tactics (e.g., reinforcement, response prompting) within naturalistic and developmentally-appropriate social interactions and play routines (Debodinance, Maljaars, Noens, & Van den Noorgate, 2017; Odom, Boyd et al., 2010). Interventions that fall into this latter, behavioural-developmental, category appear to be the

[2] Based on: Tupou, J., van der Meer, L., Waddington, H., & Sigafoos, J. (2019). Preschool interventions for children with autism spectrum disorder: A review of effectiveness studies. *Review Journal of Autism and Developmental Disorders, 6*, 81-402. doi:10.1007/s40489-019-00170-1

most widely used in contemporary practice, perhaps due to the growing evidence base supporting their efficacy (Ospina et al., 2008).

Positive outcomes across a range of domains of functioning (e.g., social, play, cognitive, and communication skills) from such behavioural/developmentally-oriented early intervention programmes have been documented in a number of studies (e.g., Dawson, 2008; Debodinance et al., 2017; Drahota, Aarons, & Stahmer, 2012; Estes et al., 2015; Keenan & Dillenburger, 2011; Reichow, 2012). However, in most existing studies the treatment procedures were implemented by researchers or therapists in a one-on-one format or within specialist small-group arrangements, rather than by usual personnel (e.g., teachers) in more naturalistic/inclusive group settings (Young, Falco, & Hanita, 2016). That is, most research to date has examined efficacy rather than effectiveness. To advance evidence-based practice with respect to the implementation of early intervention programmes, it would seem critical to evaluate outcomes from effectiveness studies, that is studies in which the treatment procedures were implemented under more natural, real world conditions, such as in inclusive preschool settings with teachers serving as the intervention agents.

An inclusive preschool-based approach to the delivery of interventions would seem to offer several potential advantages over delivery of intervention by experts in more structured/clinical settings. First, international guidelines recommend delivery of interventions in settings that (a) provide ongoing opportunities for interaction with typically developing peers, and (b) are the least restrictive environment for meeting the individual's needs (Broderick, 2017; United Nations, 2006). Inclusive preschools are perhaps more likely to meet these requirements than clinical settings as they offer the opportunity for children with ASD to be part of the same learning environment as their typically developing peers and to practice the social behaviours needed to interact with these peers (Vivanti, Duncan, Dawson, & Rogers, 2017). Opportunities for interaction with peers would seem especially important for young children with ASD because of the associated social communication impairments, which are likely to interfere with forming positive peer relationships. The presence of typically developing peers in an inclusive preschool setting might be useful for promoting more positive peer relations and offering models of age-appropriate play, communication, and social behaviour (Koegel, Koegel, Frea, & Fredeen, 2001).

Providing early intervention in an inclusive preschool setting would also seem to offer some potential cost saving, as intervention could be delivered to more than one child at a time using existing resources (e.g., existing teaching staff, physical spaces and equipment). Additionally, there is a documented disparity in children's access to early intervention

services (Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007) and healthcare (Kramer et al., 2017). Specifically, ethnicity, parental education, and geographic location may all impact on families' ability to access ASD-related services (Thomas et al., 2007). Addressing this disparity has been cited as an important and under-studied area of research in the area of ASD intervention (Interagency Autism Coordinating Committee, 2013). Delivering intervention in an inclusive preschool environment might help to address this disparity to some extent, particularly if the young child with ASD is already attending an inclusive preschool where early intervention could be provided.

Existing teaching staff would seem to be the most logical intervention agents for interventions conducted in inclusive preschool settings because they are likely to have knowledge of early development and learning as well as familiarity with the unique needs and interests of the children they teach (Lawton & Kasari, 2012). It is important to note, however, that some research suggests that typical pre-service training may not equip teachers with the knowledge, skills, and/or levels of confidence required to meet the needs of children with ASD (Mitchell & Hegde, 2007). Thus, it seems important to examine how teaching staff in inclusive preschools might be trained to meet the needs of the young children with ASD that they teach.

Given the increasing need for, and potential positive outcomes from, early intervention programmes for young children with ASD — and the potential advantages of inclusive preschool-based delivery of interventions by teaching staff — it seems important to explore whether such interventions can be delivered in this type of setting and whether doing so is likely to produce positive outcomes for the child. In this review, we sought to identify studies involving the provision of early intervention to children with ASD who were attending inclusive preschool settings. We also sought to appraise the quality of the identified studies and evaluate their effects on child outcomes. The strategies used in training teaching staff to implement these interventions with fidelity were a particular focus of the review as well. The specific questions addressed in this review are:

1. What types of intervention procedures/programmes have been used in the included studies?
2. What are the design characteristics and rigor of the included studies?
3. What were the characteristics of the participants involved in the studies?
4. How were teaching staff trained to implement the intervention procedures and to what extent did this training enable the staff to implement the interventions with fidelity?

5. What were the range of outcomes for the children with ASD who received intervention?
6. To what extent were the interventions/staff training procedures perceived by stakeholders to be effective and acceptable (i.e., socially valid)?

Method

Search and Screening Procedures

Searches were carried out by the first author using the PsycINFO, ERIC, Scopus, PubMed and Proquest databases. For all databases, the following search terms were entered into the 'Anywhere' field: *Autis* OR ASD AND "Teacher led"* OR *"teacher implemented" AND Intervention OR program* OR treatment AND "Early intervention"* OR *preschool* OR *"early childhood"*. Results were limited to journal articles published in English between 2000 to 2017. These initial electronic searches returned 351 articles.

The titles and abstracts for these 351 articles were then reviewed to screen them for their potential eligibility for inclusion. At this stage, 16 articles were deemed eligible for inclusion and consequently the full text of each of these articles was reviewed to ensure that each study met all of the inclusion criteria. Ten articles met all of the inclusion criteria. An ancestral search of the reference lists of the included articles from the database search produced a further four articles for inclusion. Finally, author searches were conducted on the authors of the included articles from the database and ancestral searches. These author searches produced an additional five articles for inclusion. At this stage, three articles were excluded because they involved both inclusive and non-inclusive preschool settings and the data from non-inclusive preschools could not be separated from the data from the inclusive preschools. In total, 16 articles met the inclusion criteria.

Inclusion Criteria

To be included in the review, studies needed to meet several criteria. First, the study had to have evaluated outcomes from interventions that were conducted in inclusive preschool settings. An inclusive preschool setting was defined as an educational and/or care setting for preschool-aged children (typically aged 1 to 6 years) that included both children with and without disabilities. In addition, the interventions had to have been implemented by the staff who regularly worked in that setting. Staff could include teachers, paraeducators, teaching assistants, or similar personnel. The study also had to include at least one child participant who was (a) aged between 12 and 72 months or attending the preschool, and (b) had a diagnosis of ASD, Autism, Asperger's Syndrome or Pervasive Developmental Disorder- Not Otherwise Specified (PDD-NOS). If a study also included one or more

participants who did not meet these inclusion criteria, only data from the participants who were eligible for inclusion was extracted and analysed. If data from eligible participants could not be separated out, the study was excluded. Studies set in special education classrooms and studies focused on interventions implemented by parents, researchers, or specialists that were not regular preschool staff were excluded as were case studies, studies with qualitative designs, and theses or dissertations.

Data Extraction

The following data were extracted from each included study: (a) type of study design, (b) child characteristics (number, age, and diagnoses), (c) intervention characteristics (intervention type, frequency, and duration), (d) teacher training (method, frequency, and duration), (e) research quality/rigor, (e) child outcomes (type of outcome, method of measurement, and results), (f) teacher outcomes/behaviour (type of outcome/behaviour, method of measurement, and results), and (g) social validity (method of measurement and results).

Results were classified as positive, mixed, or no effect/negative. For studies with a single-case design, a positive result was coded when positive changes for all primary dependent variables (DV), all participants, and all intervention phases were reported. Mixed results referred to situations where authors reported minimal or no improvement or highly variable results for one or more participants, primary DVs, and/or intervention phases. Finally, a coding of no effect or a negative result meant that the intervention was not associated with any positive results for any of the participants or for any of the primary DVs. For studies using group designs, results for each DV were reported separately. A positive result was coded when authors reported significant improvements for the experimental group (EG) for a given DV. Where control group (CG) data were reported, improvements observed in the EG needed to be significantly better than those observed in the CG for the result to be coded positive. Conversely, a code of no effect or negative result was used when no significant improvements were reported for the EG and/or reported improvements for the EG were not significantly better than those reported for the CG.

A modified version of Goldstein, Lackey, and Schneider's (2014) framework was used to evaluate each included study for its quality/rigor. The quality criteria used in this framework are consistent with those proposed by Cook et al. (2009) and the School Psychology Division of APA (Kratochwill & Stoiber, 2002).This framework was chosen because it is suitable for use with both single-case and group-design studies and allows for a quantification of the quality/rigor of a study across a comprehensive set of specific quality

indicators (Snyder et al., 2015). This framework was also selected because it allows readers to graphically view the strengths and weaknesses of studies and thus provides the ability for readers to quickly assess studies (individually and collectively) across the variables that they are most interested in.

Using this framework, included studies were evaluated across four broad areas: (a) design characteristics and internal reliability, (b) measurement features, (c) general characteristics, and (d) results and external validity. Thirteen quality criteria, across the four aforementioned areas, were used to evaluate all studies (including group designs and single-case research designs). These 13 criteria are: (a) design characteristics, (b) measurement (c) reliability, (d) intervention fidelity, (e) training fidelity, (f) rationale, (g) robust treatment effects, (h) statistics, (i) maintenance and generalization, (j) implementation site, (k) participant selection, (k) consumer satisfaction and (l) social validity. For single-case research designs, two additional criteria (quality of baseline and visual analysis) were used. Definitions and guidelines for assigning ratings for each criterion are included in Goldstein et al.'s framework.

The procedures that we used for evaluating the quality of the studies involved having the first author examine each article and assign a rating of between 1 and 4 for each applicable category. A score of 4 represented exemplary performance, 3 represented acceptable performance, 2 represented minimal performance, and a score of 1 represented unacceptable performance. A total mean score was then calculated for each study by dividing the sum of the study's scores for each category by the number of categories scored.

Interrater Agreement

A second reviewer independently reviewed the full text of all articles identified during the database, ancestral, and author searches to check on their eligibility against the inclusion criteria. Before undertaking any agreement checks, the primary rater (first author) and the independent rater (second author) discussed the inclusion criteria and the types of data to be extracted from each article. Interrater agreement on whether or not each identified article did or did not meet the inclusion criterion was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Overall agreement for all searches was 88.3% (range = 80 to 100%). Agreement on the accuracy of data extraction was also assessed for all included studies and for all variables. Agreement ranged from 96 to 99% with a mean of 97%. Disagreements were discussed to obtain consensus.

Results

The 16 included studies are summarised in Tables 2.1-2.4. Table 2.1 summarises design, child characteristics, and intervention characteristics. Table 2.2 summarises child outcomes, Table 2.3 summarises teacher outcomes, and social validity, and Table 2.4 provides an evaluation of each study's design characteristics and the presence of specific quality indicators.

Child Characteristics

A total of 809 children participated across the 16 included studies. We classified children in terms of the diagnoses they had been assigned in the original research reports. Of these participating children, 734 (91%) had a diagnosis of autism/ASD, 25 (3%) had a diagnosis of PDD-NOS, 1 child (<1%) had a diagnosis of Asperger's Syndrome, and 1 (<1%) child had no formal diagnosis, but was reported to have displayed autism-like symptoms. A further 48 children (6%) from one study (Schwartz, Sandall, McBride, & Boulware, 2004) had a diagnosis of either ASD or PDD-NOS, however the authors did not specify which diagnosis each child had. The mean age across studies was 45.9 months. This mean does not include the participants from Schwartz et al. (2014) because these authors only provided the range of participants' ages, not the mean. Early intervention was provided to 517 (64%) of the participating children with the remaining 292 children (36%) assigned to CGs that received treatment as usual.

Table 2.1

Summary of Child Characteristics, Intervention Characteristics, and Teacher Training for Included Studies

Study	Design	Child Characteristics			Intervention Characteristics		Teacher Training	
		n	Age (months)	Diagnosis	Type	Frequency (sessions per week), Intensity (hours per week) & Duration	Method	Frequency (sessions per week), Intensity (hours per week) & Duration
Boulware et al. (2006)	Single-group pre- and post-test.	4	M = 24.8	ASD	Project DATA for toddlers.	Integrated playgroup: 2 (frequency) x 3 (intensity); Individualized instruction: 3 x 6; Family/home support: NS x 7 for 9 – 21-mths (M = 13.5)	NS	NS
D'Elia et al. (2014)	Nonequivalent comparison-group	30 (CG=15, EG=15)	CG: M = 49 EG: M = 49	AD (n=15) PDD-NOS (n=15)	EG: Low intensity TEACCH programme. CG: Speech & Psychomotor therapy.	Frequency: NS Intensity: EG: 2at home and 2 at school. CG: 2 of each type at school. Duration: 24-months.	NS	NS
Eikeseth et al. (2012)	Nonequivalent comparison-group	59 (CG=24, EG=35)	CG: M=53 EG: M=47	Autism	EG: Treatment based on Lovaas' UCLA model CG: TAU.	Frequency: NS Intensity: EG:15 – 37 (M= 23). Additional hours each week (number NS) in the child's home. Duration: 24-months	NS	NS
Eldevik et al. (2012)	Nonequivalent comparison-group	43 (CG=12, EG=31)	M = 44	ASD(n=34) PDD-NOS (n=8) Asperger (n=1)	EG: EIBI programme. Delivered via 1:1 discrete trial format, shifting to small group settings with an eventual goal of naturalistic teaching. CG: TAU.	EG: 5x 13.6; CG: NS (but at least 5-hrs per week) for M= 25-months.	Apprenticeship model using modeling, mentoring and coaching.	Consultations: 1 x 1 - 4; Team meetings: 1 x 2 for the duration of intervention (M = 25-mths). Plus one-off 3-day workshop.

Fleury & Schwartz (2017)	Multiple-baseline across groups.	9	M = 51	ASD	Dialogic reading techniques.	4 x 0.55 for 1.2-months	Initial group training session involving video and live-modelling of procedures, practice with other trainees and feedback. Individual feedback (oral and written) and coaching sessions.	Exact frequency, intensity and duration NS. Initial training: 2-hrs; Feedback and coaching sessions: ≥ 3 sessions.
Garfinkle & Schwartz (2002)	Multiple-baseline across participants.	4	M = 53	ASD (n = 3) No formal diagnosis but display of ASD-like symptoms (n = 1).	Small-group peer imitation intervention.	5 x 0.83 Duration: NS	Details of initial training NS but fidelity was monitored throughout the implementation phase and didactic coaching provided as necessary.	NS.
Gibson et al. (2010)	Single-case ABAB	1	48	Autism	Functional Communication Treatment (FCT).	Frequency: NS Intensity: Weekly NS but 1 x 15-min session per day for 12-sessions (monthly NS).	Training was delivered by a consultant via videoconferencing software and included written instruction, modelling, role play, descriptive praise and corrective feedback.	One-off session - continued until teacher and teaching assistant reached 100% fidelity and were confident using procedures (45-min).
Harjusola-Webb & Robbins (2012)	Multiple-baseline across participants.	3	M = 36	ASD	Naturalistic communication-promoting strategies package based on PRT and EMT.	Frequency: NS Intensity: Teachers were instructed to embed the intervention throughout the entire daily routine (participants were enrolled at the preschool for 18-hrs per week). Duration: NS but data collected for 6-months	Intervention strategies manual and regular standardized meetings with researchers.	Frequency: 1 x 0.17-0.67 for the entire intervention (M = NS).

Kern & Aldridge (2006)	Multiple-baseline across participants.	4	M = 47.5	Autism	Embedded music therapy.	NS but participants were observed for 10-mins per day for 30 (Eric), 56 (Ben), 63 (Phillip) or 71 (Lucas) sessions. Duration: 8-months.	Didactic training with the study's author.	NS, however staff training ended when teaching staff indicated that they were comfortable with both the song and the intervention procedure.
Kern et al. (2007)	Single-subject withdrawal design.	2	M= 39.5	Autism	Music therapy.	Frequency: NS Intensity: Weekly NS but 2-10 mins per day. Duration: M = 2.5-months	Initial consultation to establish goals and procedures. Direct modelling of songs and interaction with participants.	Frequency: NS Intensity: NS Duration: 0.5-mths.
McBride & Schwartz (2003)	Multiple-probe across participants	2	M = 56	Autism (n=1) PDD-NOS (n=1)	Activity-Based Intervention (ABI) and ABI with discrete trials.	Frequency: NS Intensity: Weekly NS but 30-35 mins per session Duration: M=14.5 sessions (monthly NS).	Initial planning meeting, didactic training session, hands-on training session and verbal feedback from researcher after each observation.	Exact frequency, intensity and duration NS. Length of initial planning meeting NS; Didactic training session: 45-mins; Hands-on training session: 30-mins. Feedback after observations continued until teachers reached 80% fidelity for 3 consecutive sessions.
Olive et al. (2007)	Multiple-probe across participants.	3	53	Autism (n = 2), PDD-NOS (n = 1)	Enhanced Milieu Teaching combined with a voice output communicatio n aid.	4 x 0.33 Duration: NS, however data were collected over 1-month.	Graduate course on communication intervention.	NS.
Schwartz et al. (2004)	Single group pre-post-test	48	All aged 36 – 72 months.	Autism (n= NS) PDD-NOS (n= NS)	Project DATA.	Frequency: NS Intensity: 20 Duration: M=16-months	NS	NS

Strain & Bovey (2011)	Clustered randomized design	294 (C =117, EG=177)	50.4	ASD	EG: LEAP full training. CG: LEAP manuals, and training materials (e.g. Power Point slides) only.	Frequency: Integrated into the daily pre-school programme. Number of sessions per week varied across participants. Intensity: M=17 Duration: 2-years	Seven-phase educational model including written instruction, discussion, demonstration, in-vivo practice, feedback, evaluation and follow-up.	Frequency: NS Intensity: Exact hours per week NS but 23-days total. Duration: 24-mths.
VanDerHeyden et al. (2002)	Reversal design (A-B-A-C-A-C)	1	29	ASD	Within-& extra-stimulus prompts to increase targeted toy play behaviours.	2 x 1-day (number of hours NS) Duration: NS, however data were collected over 36 sessions.	NS	NS
Young et al. (2016)	Randomized controlled trial.	302 (CG=124 EG=178)	M = 52.8	ASD	EG: CAP CG: TAU	Exact frequency & intensity NS but integrated throughout the day as well as 3 x 15 min 1:1 sessions per child per day, children attended school approx. 16-hrs per week. Duration: One school year.	Workshops and collaborative on-site coaching.	Initial workshop: 10-hrs across 2 days; Onsite training: 10-hrs across 2-days; Subsequent onsite coaching (M = 27-hrs per school). Duration: NS

Note. NS = not specified; DATA= Developmentally Appropriate Treatment for Autism; TEACCH = Treatment and Education of Autistic and Related Communication Handicapped Children; EIBI = Early Intensive Behavioural Intervention; TAU = treatment as usual; LEAP = Learning Experiences and Alternative Program for Preschoolers and their Parents; PRT = Pivotal Response Training; EMT = Enhanced Milieu Teaching; CAP = Comprehensive Autism Program.

Table 2.2

Summary of Child Outcomes

Study	Outcome:	Measurement:	Findings:
Boulware et al. (2006)	Developmental functioning	BSID	BSID-II scores increased for all participants (M= 28pts). 3 participants improved their overall category rating.
	Behaviour	TABS	3 participants demonstrated improvement on the TABS, improving from 'atypical' to 'typical' (n=2) or 'at risk' (n=1).
	Communication, social and symbolic abilities.	CSBS	All participants demonstrated gains in at least 1 of the 7 communication clusters, 3 participants made significant gains (>2SD) on at least one cluster. 2 participants demonstrated gains across all 7 clusters.
	Functional outcomes (e.g. following instructions, toilet training and motor imitation)	Specifically developed functional outcome scale.	All participants demonstrated gains in at least one functional behaviour.
D'Elia et al. (2014)	Autism severity	ADOS	Decrease in 'autism' diagnoses across both groups, larger decrease in EG.
	Adaptive behaviour	VABS	Significant improvements in adaptive behaviour across both groups, slightly higher increase in EG.
	Expressive and receptive language	CDI	Significant gains in language skills across both groups with higher gains observed in EG.
	Comorbid emotional and behavioural problems.	CBC	Significant difference between EG and CG across a number of subscales, with both groups showing decrease in score across all subscales
	Psycho-educational skills and behaviour (administered to EG only)	PEP-3	Significant improvement over time in all categories except receptive language and personal self-care.
Eikeseth et al. (2012)	Adaptive behaviour	VABS	After 1-year of treatment EG showed significantly greater improvements on all VABS sub-domains (M effect size = 0.84) and within-group decreases on maladaptive behaviour for the EG were significant (ES=1.0). Changes in VABS scores during the 2nd year of treatment were not significant.
	Autism symptom severity	CARS	For EG, CARS scores decreased significantly for both the 1st (ES = 0.92) and 2nd years of treatment. No CARS data was presented for the CG

Eldevik et al. (2012)	Intellectual functioning	BSID for participants aged < 42 months, Stanford-Binet Intelligence Scale for older participants.	EG made significantly larger gains on composite scores for intelligence.
	Adaptive behaviour	VABS	EG made significantly larger gains on adaptive behaviour composite score and communication and socialization sub-domains.
Fleury & Schwartz (2017)	Verbal participation (response to adults and initiating comments/questions)	Video recordings of reading sessions (2 per week) – response rate.	The rate of response to questions improved for all participants immediately upon introduction of the intervention (M ES = 1.02). Changes in rate of initiations between baseline and intervention were minimal for 8 participants. For the 9th participant (Sam), rate of initiations decreased upon introduction of the intervention.
	Book-specific Vocabulary	Researcher-delivered assessment task using illustrations from known books to probe for target vocabulary.	Book-specific vocabulary increased for all participants during intervention phase (M increase = 1.2 words per week).
Garfinkle & Schwartz (2002)	Primary: Social initiations, frequency and types of verbal responses (positive/ negative/ no response), independent and prompted peer imitations, nonsocial engagement, physical proximity to peers during play	Direct observation using live interval recording with 5-minute intervals.	Minimal increase in social interactions for all participants. Small increase in number of imitations of peer behaviour although the number observed were highly variable.
	Collateral: Imitations of target child by typically developing peers in the generalization setting		Number of imitations increased for all participants.
Gibson et al. (2010)	Frequency of elopement	Daily observation via video conferencing software, using 20-s partial interval recording.	The mean percentage of intervals with elopement decreased from baseline phase 1 (M=96%) to intervention phase 1 (M=11%) and from baseline phase 2 (M=93%) to intervention phase 2 (M=5%).
Harjusola-Webb & Robbins (2012)	Expressive communication (including gestures, vocalizations, word	Direct observation for 30 minutes per day, 2 days per week.	Mean frequency of expressive language output increased for all participants.

	approximations, words and multi-word utterances)		
Kern & Aldridge (2006)	Positive peer interactions, play and engagement with material and equipment	Video recordings 10 minutes using 15-second momentary time-sampling recording procedure.	No/minimal increases in peer interactions observed during playground adaptation intervention phase, however increases observed for all participants during teacher-mediated and peer-mediated intervention phases.
Kern et al.(2007)	Number of steps of the morning arrival routine completed independently and number of unprompted greetings from peers	Direct observation (event recording)	Both participants increased the number of steps completed independently during the intervention, improvements declined during withdrawal phase and improved again during the second intervention phase.
McBride & Schwartz (2003)	Verbal responses (correct/no response/ incorrect), engagement and proximity to peers	Video observation using 10-s momentary time sampling.	Both children showed increases in mean response to target objectives from baseline to ABI-only and from ABI-only to ABI with discrete trial phase. Results for child engagement and proximity to peers were mixed.
Olive et al. (2007)	Prompted/independent use of voice output communication aids (VOCA), use of independent communication acts	Direct observation (event recording) of 5-minute child-teacher interactions at the child's preschool.	Prompted and independent VOCA use increased for all participants from 0 in baseline to an average of 10.2 times per 5-min session during intervention (range = 7.3 – 12.8). Total independent spontaneous communicative acts increased from baseline (M= 0.6 times per 5-min session) to intervention (M= 20 times per 5-min session).
Schwartz et al. (2004)	Child developmental progress in functional skills	AEPS, Researcher-designed Functional Outcomes Index.	Children made gains across all AEPS developmental domains (M=20.5 percentage points) over the course of 1 school year. Children also made gains across all 6 functional outcomes on the FOI (M = 24.8 percentage points).
Strain & Bovey (2011)	Autism symptom severity	CARS	Participants from EG showed a greater decrease in CARS scores (M = 6.1-point decrease) compared to the CG (M = 2.8-point decrease).
	Cognitive development.	Mullen Scales of Early Learning.	EG Mullen scores were significantly higher than CG scores after intervention.
	Language.	PLS-4	EG PLS-4 scores were significantly higher than CG scores after intervention, differences were significant at the 5% level.
	Social skills and problem behaviour.	SSRS	EG showed greater increases on the SSRS (EG: M=28.6 percentile points; CG: M=11.9 percentile points). EG also scored lower on problem behaviour ratings than the CG.

VanDer Heyden et al. (2002)	Contact with 'low contact' activity centers, planted stimulus, toy play, speech and disruptive behaviour.	Direct observation (partial-interval occurrence and responses per minute).	Contact with 'low-contact' activity centers and the planted stimulus increased for all 3 intervention phases. Disruptive behaviour was variable until the final intervention phase where it decreased to 0. No speech data was reported.
Young et al. (2016)	Autism severity. Adaptive behaviour. Cognitive development Expressive language. Receptive language. Social skills	CARS VABS BDI-2 - cognitive domain EOWPVT ROWPVT ASIEP-3 and SSRS	Intervention had a positive impact on receptive language (effect size = 0.13) and social skills (effect size = 0.19). No impact was identified on the remaining measures.

Note. ADOS = Autism Diagnostic Observation Schedule; AEPS = Assessment, Evaluation, and Programming System for Infants and Children; ASIEP-3 = Autism Screening Instrument for Educational Planning- (3^{rd} Ed.). BDI-2 = Battelle Developmental Inventory (2^{nd} ed.); BSID = Bayley Scales of Infant Development; CARS = Childhood Autism Rating Scale; CBC = Child Behavior Checklist; CDI = MacArthur Communication Developmental Inventories; CSBS = Communication and Symbolic Behavior Scales; EOWPVT = Expressive one Word Picture Vocabulary Test; PEP-3 = Psychoeducational Profile (3rd ed.); PLS-4 = Preschool Language Scale (4^{th} ed.); ROWPVT = Receptive One Word Picture Vocabulary Test; SSRS = Social Skills Rating System; TABS = Temperament and Atypical Behavior Scale; VABS = Vineland Adaptive Behavior Scales;

Table 2.3

Summary of Teacher and Social Validity Outcomes for Included Studies

	Teacher Behaviour/Outcomes			Social Validity	
Study	Outcome:	Measurement:	Findings:	Measurement:	Findings:
Boulware et al. (2006)	None	n/a	n/a	None	n/a
D'Elia et al. (2014)	Implementation fidelity	Review of each student's individual education plan (IEP).	NS	None	n/a
Eikeseth et al. (2012)	None	n/a	n/a	None	n/a
Eldevik et al. (2012)	None	n/a	n/a	None	n/a
Fleury & Schwartz (2017)	Implementation fidelity	Direct observation at least 3 times per educator across the intervention phase. Observers used a checklist developed specifically for the study by the researchers.	Mean fidelity = 95% (range = 76 – 100%).	Researcher-developed social validity questionnaire consisting of 11 items rated on a 7-point Likert-type scale and several open-ended questions.	Respondents reported that children's vocabularies and levels of verbal participation improved as a result of the intervention (mode = 6), and that the intervention was enjoyable (mode = 6) and easy to use (mode = 7). However, the limited range of books available for the intervention and some children's challenging behaviour were commonly cited challenges.
	Rate of dialogic prompt use.	Method for measuring rate of dialogic prompt use was NS.	NS		
Garfinkle & Schwartz (2002)	Implementation fidelity.	Direct observation	For 3 participants fidelity was high throughout the study, for the remaining participant initial extra coaching and guidance were required to achieve fidelity.	Social validity questionnaire for teachers consisting of 5 questions with 5-point Likert-type scale answer ratings and 4 open-ended questions.	Intervention was rated favorably across all five questions (M=4.7, 4.7, 4.7, 5.0, 4.5)

Gibson et al. (2010)	Implementation fidelity	Video observation (33% of sessions in each phase).	During baseline conditions fidelity was 100%. During intervention conditions mean fidelity was 90% (range = 87% – 100%)	Teacher satisfaction was measured using the Behavior Intervention Rating System – Revised (BIRS-R). A specifically developed open-ended questionnaire was used to gather qualitative data on teacher' perceptions of the videoconferencing technology.	Scores on the BIRS-R ranged from 5.0 – 6.0 out of 6 across all 24 items (M=5.7). Results of the open-ended questionnaire suggested that the videoconferencing software was viewed favorably by the teacher and the teaching assistant.
Harjusola-Webb & Robbins (2012)	Use of communication-promoting strategies.	Direct observation for 30 minutes per day, 2 days per week.	Increased frequency of communication-promoting strategy use for all teachers during intervention phase.	None	n/a
Kern & Aldridge (2006)	Implementation fidelity	Direct observation during teacher-mediated intervention phase.	Fidelity was very high for 3 of the 4 teachers. For Teacher 4, fidelity was <50% for the second half of Condition C.	None	n/a
Kern et al. (2007)	Use of prompting	Direct observation event recording	No data reported.	None	n/a
McBride & Schwartz (2003)	Primary Teacher Behaviour: Rate of Instruction	Video observation: Frequency count (rate) of instructional trials presented.	Teachers 2 & 3, both showed an increase in rate of instruction from baseline to ABI-only and a further increase from ABI-only to ABI with discrete trial. However, for Teacher 3 the increase from baseline to ABI-only was only minimal.	Post-intervention teacher interviews.	Teachers reported that the intervention was easy to implement and use but required more preparation time than their regular approach to teaching. They also reported that the intervention impacted positively on the class as a whole and on outcomes for participating children. Both teachers reported that they wanted to continue to use the intervention.
	Collateral Behaviours: Obligatory & Nonobligatory Interactions Physical Prompts	Interval Recording (10-s intervals)	For both teachers, obligatory and nonobligatory interactions increased in ABI-only and/or ABI with discrete trial phases. Teacher 3's use of physical prompts decreased by 38 percentage points from baseline to ABI-only and a further 5 percentage points from ABI-only to ABI with discrete trials. Teacher 2's use of physical prompts remained fairly stable across phases		

Olive et al. (2007)	Implementation fidelity	Direct observation by an independent observer using an intervention competency checklist.	M = 96.4%	None	n/a
Schwartz et al. (2004)	None	n/a	n/a	Anecdotal evidence and quotes collected from annual family interviews and letters sent by families.	Overall, parents were satisfied with the format and content of the programme, as well as their child's progress.
Strain & Bovey (2011)	Implementation fidelity	Direct observation using QPI procedural rating observational protocol	High level of fidelity to LEAP procedures achieved in EG (M= 87%). A positive correlation between fidelity and child outcome scores was detected.	Teacher questionnaire covering 14 dimensions social validity using 5-point Likert-type rating scales.	Overall, teachers rated the intervention highly, means for each item of the questionnaire ranged from 4–4.88. There was also a high correlation (r = .89) between teachers' social validity ratings and fidelity scores.
VanDerHeyden et al. (2002)	Implementation fidelity	Direct observation for correct implementation of each step of the intervention	100%	None	n/a
	Adult use of prompts and attention.	Direct observation	M=97% (range 94% - 99%)		
Young et al. (2016)	Implementation fidelity	Attendance at training workshops, post-intervention teacher interviews and direct observation using fidelity checklists.	High rate of attendance at training workshops, EG teachers had high rates of fidelity in in-class observations (M=73%). EG teachers used 1-on-1 EBPs = for M=12-mins per day	Teacher exit survey.	Positive results: 100% of respondents learned new skills to help their students and 91% planned to continue using the intervention.

Setting

The early interventions being evaluated in these studies were implemented in the regular classroom environments within inclusive preschool settings for all 16 included studies. However, in one study, part of the intervention was delivered on a one-on-one basis in a designated treatment room at the preschool (Eikeseth, Klintwall, Jahr, & Karlsson, 2012). Twelve studies (75%) took place in US-based preschools (Boulware, Schwartz, Sandal, & McBride, 2006; Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson, Pennington, Stenhoff, & Hopper, 2010; Harjusola-Webb & Robbins, 2012; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007; Schwartz et al., 2004; Strain & Bovey, 2011; VanDerHeyden, Snyder, DiCarlo, Stricklin, & Vagianos, 2002; Young et al., 2016). The remaining four studies (25%) were conducted in Italy (D'Elia et al., 2014), Norway (Eldevik, Hastings, Jahr, & Hughes, 2012), Germany (Kern & Aldridge, 2006), and Sweden (Eikeseth et al., 2012).

Intervention Approaches

Various intervention approaches were used across the 16 included studies. Seven studies (44%) delivered some type of comprehensive intervention that targeted a range of developmental areas (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012; Schwartz et al., 2004; Strain & Bovey, 2011; Young et al., 2016). These seven studies involved the use of one of six different comprehensive intervention programmes, specifically: (a) Developmentally Appropriate Treatment for Autism (DATA; Boulware et al., 2006; Schwartz et al., 2004), (b) Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH; D'Elia et al., 2014), (c) Early Intensive Behavioral Intervention (EIBI; Eldevik et al., 2012), (d) Learning Experiences and Alternative Program for Preschoolers (LEAP; Strain & Bovey, 2011), (e) Comprehensive Autism Program (CAP; Young et al., 2016), and (f) an EIBI intervention described as being based on Lovaas' UCLA model (Eikeseth et al., 2012), which in fact appears to have been based on similar principles to the EIBI intervention reported in Eldevik et al. (2012).

The remaining nine studies (56%; Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; Kern & Aldridge, 2006; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007; VanDerHeyden et al., 2002) focused on interventions that we classified as more targeted because the intervention focused on changing a less comprehensive (more specific) set of skill(s) or focused on a smaller number of specific developmental areas than did the comprehensive programmes listed before. The specific skills and developmental areas targeted in these interventions included:

(a) communication (Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007), (b) play skills (Kern & Aldridge, 2006; VanDerHeyden et al., 2002), (c) peer interaction (Garfinkle & Schwartz, 2002; Kern & Aldridge, 2006; McBride & Schwartz, 2003), and (d) reading skills (Fleury & Schwartz, 2017).

Frequency of Intervention Sessions

Frequency of intervention refers to the number of sessions per week. Seven studies (44%) included details of the frequency of intervention sessions (Boulware et al., 2006; Eikeseth et al., 2012; Eldevik et al., 2012; Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Olive et al., 2007; VanDerHeyden et al., 2002), the mean number of sessions per week across these studies was 4.2 (range: 2 to 5). A further four studies (25%; Gibson et al., 2010; Kern & Aldridge, 2006; Strain & Bovey, 2011; Young et al., 2016) provided some information on intervention frequency, but not enough for the mean number or sessions per week to be calculated.

Intensity of Intervention Sessions

Intervention intensity, that is the mean number of hours of intervention per week, was not specified for one study (Kern & Aldridge, 2006) and was unclear for a further study (VanDerHeyden et al., 2002). Another three studies (Gibson et al., 2010; Kern et al., 2007; McBride & Schwartz, 2003) provided the number of minutes per intervention session, but not enough information for the mean number of hours per week to be calculated. Two studies (Harjusola-Webb & Robbins, 2012; Young et al., 2016) reported the number of hours per week that children were enrolled to attend preschool but not the intensity of the intervention received. For the remaining nine studies (56%), mean intensity of intervention that was delivered in the preschool setting was 9.6 hours per week (range: 0.3 to 23-hours per week).

For three studies (19%), the intervention also included a family/home component that involved an additional number of hours delivered by the child's family and/or in the child's home (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012). The number of hours per week was not specified by Eikeseth et al. (2012), but for the Boulware et al. (2006) study, the family/home component involved an additional 7-hours per week of intervention and for the D'Elia et al. (2012) study, participants received an additional 2-hours of intervention per week delivered in their home.

Duration of Intervention Sessions

Duration refers to the amount of time (in months) over which the intervention was conducted. The mean duration of intervention was reported in 10 studies (63%) and ranged

from 1.2 to 25-months with a mean of 15-months. The duration of intervention was not specified or was not clearly specified in four studies (25%; Garfinkle & Schwartz, 2002; Harjusola-Webb & Robbins, 2012; Olive et al., 2007; VanDerHeyden et al., 2002). Two studies (13%; Gibson et al., 2010; McBride & Schwartz, 2003) specified the total number of sessions of intervention received, but not the period of time over which the sessions were delivered.

Staff Training

Five studies (31%) did not report any details on the approach used for training teachers to implement the intervention procedures (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Schwartz et al., 2004; VanDerHeyden et al., 2002). For the remaining studies (69%), a range of methods was used to train teaching staff, including: (a) providing a formal graduate course in communication intervention (Olive et al., 2007), (b) didactic coaching, mentoring and/or training (Eldevik et al., 2012; Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Kern & Aldridge, 2006; McBride & Schwartz, 2003;Young et al., 2016), (c) modelling (Eldevik et al., 2012; Fleury & Schwartz, 2017; Gibson et al. 2010; Kern et al., 2007; Strain & Bovey, 2011), (d) use of role play (Fleury & Schwartz, 2017; Gibson et al., 2010), (e) individual feedback (Fleury & Schwartz, 2017; Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; McBride & Schwartz, 2003; Strain & Bovey, 2011), (f) written instruction and/or feedback (Fleury & Schwartz, 2017; Gibson et al., 2010; McBride & Schwartz, 2003; Strain & Bovey, 2011), (g) group instruction and/or coaching (Fleury & Schwartz, 2017; Young et al., 2016), (h) workshops (Young et al., 2016), and (i) in-vivo practice and/or coaching (McBride & Schwartz, 2003; Strain & Bovey, 2011). In one study, training was delivered via videoconferencing (Gibson et al., 2010), another study used video modelling (Fleury & Schwartz, 2017), and a written training manual was provided to staff in the Harjusola-Webb and Robbins (2012) study. Finally, in the study by Kern et al. (2007), staff training began with an initial consultation meeting to establish intervention goals and procedures for each participating child.

The frequency, intensity and duration of staff/teacher training varied across the included studies. Seven studies (44%) did not specify the frequency, intensity or duration of training (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Garfinkle & Schwartz, 2002; Olive et al., 2007; Schwartz et al., 2004; VanDerHeyden et al., 2002) and the authors of two studies (13%) did not provide enough information for the exact frequency, intensity and duration of training to be calculated (Fleury & Schwartz, 2017; McBride & Schwartz, 2003). For one study (6%; Gibson et al., 2010) training consisted of a one, 45-min

session, this study is not included in the calculations of training frequency, intensity or duration in this section. Three studies (19%) provided details of the frequency of teacher training (Eldevik et al., 2012; Harjusola-Webb & Robbins, 2012; McBride & Schwartz, 2003). Training was delivered weekly in two of these studies (Eldevik et al., 2012; Harjusola-Webb & Robbins, 2012), and training sessions decreased to bi-weekly for one study as the intervention progressed (Eldevik et al., 2012). The intensity of teacher training was specified in two studies (Eldevik et al., 2012; Harjusola-Webb & Robbins, 2012) and ranged from 0.17 to 6-hours per week. A further two studies (McBride & Schwartz, 2003; Strain & Bovey, 2011) provided some information on the intensity of teacher training, but not enough to calculate the mean number of hours per week.

The duration of teacher training was reported in five studies (31%; Eldevik et al., 2012; Kern & Aldridge, 2006; Kern et al., 2007; McBride & Schwartz, 2003; Strain & Bovey, 2011). In two of these studies (Kern & Aldridge, 2006; McBride & Schwartz, 2003), training ended once staff reached a pre-determined level of fidelity or indicated that they were confident with using the intervention. For the remaining three studies (19%), the mean duration of teacher training was 25-months (Eldevik et al., 2012); 8-months (Kern et al., 2007) and 0.5-months (Strain & Bovey, 2011).

Child Outcomes

Table 2.2 indicates that all 16 studies reported on child outcomes. Outcomes have been grouped according to study design. Specifically, the nine studies (56%) with single-case designs primarily used direct observation to measure child outcomes so these studies have been grouped together. The remaining seven studies (44%), which all had group designs, used a range of instruments other than direct observation to assess child outcomes. The findings from these studies have been grouped according to domains of functioning.

Child outcomes for single-case design studies. The nine studies (56%) with a single-case design included at least one child outcome measured by in vivo or video observation of child behaviour (Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; Kern & Aldridge, 2006; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007; VanDerHeyden et al., 2002). The specific outcomes measured varied across studies and included frequency of elopement (Gibson et al., 2010), verbal participation in the target reading activity (Fleury & Schwartz, 2017), social initiations (Garfinkle & Schwartz, 2002), verbal responses (Garfinkle & Schwartz, 2002; McBride & Schwartz, 2003), imitation of peers (Garfinkle & Schwartz, 2002), engagement and physical proximity to peers (Garfinkle & Schwartz, 2002; McBride & Schwartz, 2003), peer imitation

of participating children (Garfinkle & Schwartz, 2002), frequency of expressive communicative acts (Harjusola-Webb & Robbins, 2012), positive peer interactions, play and engagement with materials and equipment (Kern & Aldridge, 2006), number of correctly completed steps of the morning arrival routine (Kern et al., 2007), use of a speech-generating device for communication (Olive et al., 2007), and contact with target activity centers, toy play and disruptive behaviour (VanDerHeyden et al., 2002). One study (Fleury & Schwartz, 2017) also included a researcher-developed assessment of book-specific vocabulary.

Due to the wide variety of outcomes measured across the nine single-case design studies, it is not possible to make direct comparisons. Results were coded as positive for five studies (Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007). Mixed results or minimal improvements were reported in four studies (Fleury & Schwartz , 2017; Garfinkle & Schwartz, 2002; Kern & Aldridge, 2006; VanDerHeyden et al., 2002). For example, Kern and Aldridge (2006) reported positive results across all participants, but for only two of the three intervention phases and Fleury and Schwartz (2017) reported minimal improvement in child verbal initiations, but positive results for all other measured child outcomes.

Child outcomes for group design studies. For the seven group design studies, a range of instruments were used to measure child outcomes. Six (86%) of these group studies (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012; Strain & Bovey, 2011; Young et al., 2016) measured children's adaptive/maladaptive behaviour using a range of instruments including: (a) Temperament and Atypical Behavior Scale (TABS; Bagnato, Neisworth, Salvia, & Hunt, 1999), (b) Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984), (c) Child Behavior Checklist (CBC: Achenbach, 1991), and (d) the Social Skills Rating System (SSRS; Gresham & Elliot, 1990). Five (71%) of these group design studies that measured adaptive/maladaptive behaviour reported positive results (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012; Strain & Bovey, 2011), while the remaining study was coded as having no effect because there were no significant changes in participant scores for the EG (Young et al., 2016). Functional skills were measured as outcomes in two (29%) of the group studies (Boulware et al., 2006; Schwartz et al., 2004) and were assessed using (a) Bayley Scales of Infant Development (Bayley, 2006), (b) Assessment, Evaluation and Programming System for Infants and Children (AEPS; Bricker, 1994), (c) a researcher-developed functional outcomes index (Schwartz et al., 2004), and (d) a researcher-developed functional outcomes scale (Boulware et al., 2006). Participating children from both studies demonstrated gains across at

least one functional outcome and participants from the Schwartz et al. (2004) study made gains across all six of the functional outcomes measured.

Four (57%) of the seven group studies reported on measures of autism severity and/or symptoms (D'Elia et al., 2014; Eikeseth et al., 2012; Strain & Bovey, 2011; Young et al., 2016) using the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, Pamela, Dilavore, & Risi, 2008), or the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 2002). D'Elia et al. (2014) reported decreases in autism diagnoses across both EGs and CGs, as measured by the ADOS, with a larger decrease observed in the EG. Similarly, in the study by Strain and Bovey (2011), the EG demonstrated a greater decrease in CARS scores than the CG. The Eikeseth study (2012) reported a significant decrease in CARS scores for the EG, but did not report comparison data for the CG. The authors of the final study (Young et al., 2016), did not report any significant change in CARS scores.

Child communication and/or language was measured in five (71%) of the group studies (Boulware et al., 2006; D'Elia et al., 2014; Fleury & Schwartz, 2017; Strain & Bovey, 2011; Young et al., 2016) via a range of different instruments including: (a) Communication, Social and Symbolic Behavior Scales (CSBS; Wetherby & Prizant, 2002), (b) MacArthur Communication Developmental Inventories (CDI; Fenson et al., 1993; Fenson et al., 1994), (c) Pre-school Language Scale (PLS; Zimmerman, Steiner, & Pond, 1991), (d) Expressive One Word Picture Vocabulary Test (EOWPVT; Brownell et al., 2000a), (e) Receptive One Word Picture Vocabulary Test (ROWPVT; Brownell et al., 2000b), and (f) a researcher-delivered book vocabulary assessment (Fleury & Schwartz, 2017). Participants demonstrated improvement on at least one communication/language outcome across all five of these studies.

Two (29%) of the group studies (Strain & Bovey, 2011; Young et al., 2016) reported on social skills, which were measured via the Social Skills Rating System (SSRS; Gresham & Elliot, 1990) and the Autism Screening Instrument for Educational Planning (ASIEP; Krug et al., 2008). Both studies reported positive results, with the EG making greater improvements than the CG in both cases.

Aspects of child cognition or educational strengths and weaknesses were reported as outcomes in four (57%) of the group studies (D'Elia et al., 2014; Eldevik et al., 2012; Strain & Bovey, 2011; Young et al., 2016). Intellectual functioning was measured in one study (Eldevik et al., 2012) using the Bayley Scales of Infant Development (BSID; Bayley, 2006) for participants younger than 42-months of age, and the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1986) for participants older than 42-months. Overall, the EG

made significantly greater gains than the CG on composite scores for both instruments. Another study (D'Elia et al., 2014) measured psycho-educational skills using the Psychoeducational Profile: Third Edition (PEP-3; Schopler et al., 2005) and found that EG participants made significant improvements over time across most categories. Finally, child cognitive development was measured in two (29%) of the seven group studies (Strain & Bovey, 2011; Young et al., 2016) using the Mullen Scales of Early Learning (Mullen, 1995) and the cognitive domain of the Bayley Scales of Infant Development (BDI; Bayley, 2006). In the Strain and Bovey (2011) study, EG scores were significantly higher than CG scores after intervention, however, no significant change in scores was reported in the Young et al. study.

Teaching Staff Outcomes

Table 2.3 shows that four (25%) of the included studies did not report any measures of teacher outcomes (Boulware et al., 2006; Eikeseth et al., 2012; Eldevik et al., 2012; Schwartz et al., 2004). For the purposes of this review, the term 'implementation fidelity' has been used as an umbrella term to describe the extent to which interventions were delivered as intended and in line with the programme model or prescribed procedures. The included studies used a range of terms to refer to this concept including: Fidelity of intervention implementation (D'Elia et al., 2014; Olive et al., 2007; Strain & Bovey, 2011; Young, Falco & Hanita, 2016); procedural fidelity (Fleury & Schwartz, 2017; VanDerHeyden et al. 2002); treatment fidelity (Garfinkle & Schwartz, 2002) and fidelity of treatment (Kern & Aldridge, 2006).

Implementation fidelity was measured as a teacher outcome in 9 (56%) of the 16 included studies (D'Elia et al., 2014; Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Kern & Aldridge, 2006; Olive et al., 2007; Strain & Bovey, 2011; VanDerHeyden et al., 2002; Young et al., 2016). However, in one of these nine studies (D'Elia et al., 2014), the authors did not actually provide the results of their fidelity checks. Implementation fidelity was measured via direct observation in eight of these studies (Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Kern & Aldridge, 2006; Olive et al., 2007; Strain & Bovey, 2011; VanDerHeyden et al., 2002; Young et al., 2016), and through review of participating children's individual education plans (IEP) for the ninth study (D'Elia et al., 2014). Young et al. also included data on teachers' rate of attendance at training workshops and responses from teacher exit interviews to support data from the in-class observations. Six studies (38%) reported high levels of implementation fidelity (M = 90%, range of means = 73 to 100%; Fleury & Schwartz, 2017; Gibson et al., 2010; Olive et

al., 2007; Strain & Bovey, 2011; VanDerHeyden et al., 2002; Young et al., 2016). Two studies (13%) reported mixed results with some participating teachers failing to reach high fidelity levels (Kern & Aldridge, 2006) or requiring additional coaching to reach required fidelity levels (Garfinkle & Schwartz, 2002). Young et al. (2016) also reported high rates of attendance at teacher-training workshops.

Other teacher outcomes related to the use of specific teaching techniques including: (a) rate of dialogic prompt use (Fleury & Schwartz, 2017); (b) use of communication-promoting strategies (Harjusola-Webb & Robbins, 2012); (c) use of prompting (Kern et al., 2007); (d) rate of instruction, use of physical prompts and interactions with the target child (McBride & Schwartz, 2003); and (e) use of prompts and attention (VanDerHeyden et al., 2002). For most of these studies, outcomes were assessed via direct observation (Harjusola-Webb & Robbins, 2012; Kern et al., 2007; VanDerHeyden et al., 2002) or video observation (McBride & Schwartz, 2003). However, Fleury and Schwartz (2017) did not specify the method of measurement used. Two studies reported positive results (Harjusola-Webb & Robbins, 2012; VanDerHeyden et al., 2002), one study reported mixed results (McBride & Schwartz, 2003) and two studies did not report the results (Fleury & Schwartz, 2017; Kern et al., 2007).

Social Validity

As displayed in Table 2.3, nine studies (56%) did not appear to have assessed social validity (Boulware et al., 2006; D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012; Harjusola-Webb & Robbins, 2012; Kern & Aldridge, 2006; Kern et al., 2007; Olive et al., 2007; Schwartz et al., 2004; VanDerHeyden et al., 2002). Among the seven studies (44%) that did include a measure of social validity, five of these studies did so by administration of a questionnaire that was completed by the teaching staff (Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Strain & Bovey, 2011; Young et al., 2016), whereas one study used teacher interviews (McBride & Schwartz, 2003), and one study reported on what would appear to have been more anecdotal evidence on social validity that was provided by participants' families (Schwartz et al., 2004). Due to the range of different measures used to evaluate social validity across these seven studies, results cannot be summarised or compared. However, the reported results were generally positive, with the interventions rated highly by teachers (Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; McBride & Schwartz, 2003; Strain & Bovey, 2011; Young et al., 2016) and parents (Schwartz et al., 2004). Strain and Bovey (2011) reported a strong correlation (r = .89)

between teachers' implementation fidelity and their ratings of the social validity of the intervention.

Design Characteristics and Quality Ratings

A detailed analysis of each study's design characteristics and presence of specific quality indicators are presented in Table 2.4. Nine (56%) of the included articles used single-case research designs (Fleury & Schwartz, 2017; Garfinkle & Schwartz, 2002; Gibson et al., 2010; Harjusola-Webb & Robbins, 2012; Kern & Aldridge, 2006; Kern et al., 2007; McBride & Schwartz, 2003; Olive et al., 2007; VanDerHeyden et al., 2002). The remaining seven articles (44%) used group designs including a single group pre-test and post-test design (Boulware et al., 2006; Schwartz et al., 2004), nonequivalent comparison-group design (D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012), randomized controlled trial (Strain & Bovey, 2011), and cluster randomized trial (Young et al., 2016).

The quality of each study was assessed using the quality-rating framework developed by Goldstein et al. (2014) and the results are displayed in Table 4. The mean quality rating across all of the included studies was 2.5 out of 4 (range = 1.8 to 3.4). This mean score can be loosely translated as indicating a minimal-acceptable level of quality (Goldstein et al., 2014). In order to receive a rating of 'minimal quality', studies needed to have an overall mean score of at least 2, Boulware et al.'s (2006) study received a mean rating of 1.8 and was the only included study that did not meet the standards for minimal quality. Only one of the included studies (Strain & Bovey, 2011) demonstrated an 'acceptable' level of quality, with a mean score of 3.4. The mean scores for the remaining 14 studies ranged from 2.1 to 2.9. With respect to scores for each category, studies tended to score highly for study rationale (M = 3.3), robust treatment effects (M = 3.1), and the external validity of the implementation site (M = 4), and studies with single-case designs tended to score highly for quality of baseline (M = 3.4) and visual analysis (M = 3.3). Lower mean scores were obtained for social validity (M = 1.5), consumer satisfaction (M = 1.9) maintenance and generalization (M = 1.8), and training fidelity (M = 1.9). The mean scores for the remaining categories ranged from 2 to 2.6.

Table 2.4

Experimental Design and Quality Indicators for Included Studies

			Measurement and Reliability				General Characteristics and Results						Dimensions of External Validity			
Citations	Average Rating	Design Characteristics	Measurement	Reliability	Intervention fidelity*	Training fidelity**	Rationale	Robust Treatment Effects	Quality of Baseline	Visual Analysis	Statistics	Maintenance and Generalization	Implementation Site	Participant Selection	Consumer Satisfaction	Social Validity
Boulware et al. (2006)	1.8	●	⊙	●	●	●	⊙	⊙	n/a	n/a	●	◎	○	◎	●	●
D'Elia et al. (2014)	2.2	◎	○	●	●	●	⊙	◎	n/a	n/a	⊙	⊙	○	⊙	●	●
Eikeseth et al. (2012)	2.1	●	⊙	●	●	●	⊙	⊙	n/a	n/a	⊙	⊙	○	◎	●	●
Eldevik et al. (2012)	2.5	◎	⊙	◎	●	◎	○	○	n/a	n/a	○	◎	○	⊙	●	●
Fleury & Schwartz (2017)	2.6	⊙	⊙	◎	⊙	●	○	⊙	⊙	◎	⊙	●	○	◎	⊙	◎
Garfinkle & Schwartz (2002)	2.6	⊙	◎	⊙	⊙	●	○	◎	⊙	⊙	●	⊙	○	◎	⊙	◎
Gibson et al. (2010)	2.9	◎	◎	⊙	○	○	⊙	○	○	○	●	●	○	◎	○	◎
Harjusola-Webb & Robbins (2012)	2.5	⊙	◎	⊙	⊙	◎	⊙	○	○	○	●	●	○	◎	●	●
Kern & Aldridge (2006)	2.7	○	◎	⊙	⊙	⊙	⊙	⊙	○	○	●	●	○	⊙	●	●
Kern et al. (2007)	2.3	⊙	◎	◎	●	◎	⊙	⊙	○	○	●	●	○	⊙	●	●
McBride & Schwartz (2003)	2.6	⊙	◎	⊙	⊙	⊙	⊙	⊙	⊙	◎	●	◎	○	◎	⊙	◎
Olive et al. (2007)	2.3	⊙	◎	⊙	⊙	●	⊙	⊙	⊙	○	●	●	○	◎	●	●
Schwartz et al. (2004)	2.2	●	⊙	●	●	●	⊙	⊙	n/a	n/a	●	◎	○	⊙	⊙	◎
Strain & Bovey (2011)	3.4	⊙	⊙	◎	○	⊙	⊙	○	n/a	n/a	○	⊙	○	○	○	⊙
VanDerHeyden et al. (2002)	2.3	⊙	◎	⊙	⊙	●	⊙	⊙	⊙	⊙	●	◎	○	◎	●	●
Young et al. (2016)	2.9	○	○	●	⊙	⊙	⊙	⊙	n/a	n/a	○	●	○	○	◎	◎
Average rating by criterion	**2.5**	**2.4**	**2.6**	**2.1**	**2.4**	**1.9**	**3.3**	**3.1**	**3.4**	**3.3**	**2.0**	**1.8**	**4.0**	**2.6**	**1.9**	**1.5**

Note: 4 = ○ Exemplary, 3 = ⊙ Acceptable, 2 = ◎ Minimal, 1 = ● Unacceptable

Table adapted from Goldstein, Lackey & Schneider's 2014 framework designed for evaluating the quality of research studies for systematic reviews. * Relates to the fidelity with which the intervention itself is implemented ** Relates to the fidelity with which teacher training is implemented.

Discussion

The purpose of this review was to gather, summarise, and evaluate the empirical literature regarding teacher-implemented early interventions for young children with ASD. The review was limited to studies conducted in inclusive preschool settings to assess intervention effectiveness, that is the effects of interventions when implemented under "real world" conditions. A systematic search of the literature produced 16 articles that met the inclusion criteria. Nine (56%) of the included studies used a single-case research design, three studies (19%) used a nonequivalent comparison-group design, two (13%) used a single-group pre-test post-test design, and two studies (13%) were randomized controlled trials. Various intervention approaches were evaluated across the studies, including six different comprehensive interventions and a range of targeted interventions focused on specific skills or developmental areas. Intervention dosage also varied widely across studies, as did the method, frequency, and duration of teacher training.

Child Outcomes

Overall, the results from the present review suggest that interventions delivered by teaching staff in an inclusive preschool setting can be effective in improving outcomes for young children with ASD. For 14 (88%) of the 16 included studies, the participating children were reported to have made gains in at least one primary outcome variable. For the remaining two studies (13%), the participating children made showed minimal improvement or variable gains across the primary outcome measures (D'Elia et al., 2014; Garfinkle & Schwartz, 2002). Interestingly, both of these studies reported positive results on secondary or collateral outcomes. The Garfinkle and Schwartz (2002) study also reported some generalization of child behaviours to non-target activities and/or peers and highly favorable teacher ratings regarding the benefit of the intervention to target children. For the D'Elia et al. study, mean improvements for the EG were only slightly higher than those observed in the CG across most primary outcomes, however no implementation fidelity data were reported and so it is difficult to know whether teaching staff implemented the intervention with integrity.

More than 20 different child outcomes were measured across the 16 included studies via a range of different methods and instruments. Direct observation (either in-vivo or via video), was the most commonly used method. The specific outcomes measured via direct observation varied widely across studies, possibly because of the wide variety of outcomes targeted by different interventions (particularly interventions focused on specific skills/developmental areas). However, there was also a lack of consistency in the way that broader outcomes (e.g., adaptive behaviour, autism severity, and communication skills) were

measured. Twenty different instruments were used to measure broad child outcomes across six (38%) of the included studies, but only four of these instruments were used in more than one study. This variation in the approach to the measurement of outcomes across studies would seem to hinder cross-study comparisons of interventions, which is important for informing decisions regarding which treatment/treatments should be considered best practice (Ospina et al., 2008).

It is also important to determine whether a given intervention has a more positive effect than treatment as usual (TAU). Thus, it is useful for intervention research to compare the focus intervention with the treatment(s) that participants would typically receive. Furthermore, studies need to include a clear, detailed description of TAU conditions (Dingfelder & Mandell, 2011). Four (25%) of the studies included in this review compared specific interventions with TAU and found that the intervention group performed significantly better than the CG on at least one primary outcome (Eikeseth et al., 2012; Eldevik et al., 2012; Strain & Bovey, 2011; Young et al., 2016). This suggests that the interventions being evaluated in these studies appeared to be more effective than the treatment that the target children would have ordinarily received, had they not participated in the study. It is important to note that for the Eldevik et al. (2012) study, the participants were not randomly allocated to a treatment condition and this may have compromised the validity of the comparison between the EG and the CG. However, the authors reported group equivalence with respect to age, gender, duration of intervention, diagnosis, and level of intellectual disability prior to the beginning of the study. A further study (D'Elia et al., 2014) also compared intervention with TAU and reported that EG improvements on primary outcomes were not significantly better than those recorded for the CG.

Research on intervention effectiveness should also include measures of the generalization and maintenance of observed results (Koegel & Rincover, 1977). However, only two studies (13%) reported on generalization of child behaviour (Garfinkle & Schwartz, 2002; VanDer Heyden et al., 2002). VanDerHeyden et al. reported on generalization of child behaviour to non-target activity centers and the study by Garfinkle and Schwartz included data on generalization of child behaviour to a non-target activity and non-target peers. The study by Garkinkle and Schwartz also included a 2- to 4-week follow-up phase and was the only included study to report on maintenance of child behaviour. A further five studies (31%) did not include a follow-up phase, but measured child outcomes across a relatively long-term (> 12 months) intervention phase (D'Elia et al., 2014; Eikeseth et al., 2012; Eldevik et al., 2012; Strain & Bovey, 2011; Young et al., 2016). However, these data do not show whether

target behaviour(s) occurred absent the intervention, an important consideration given that it is possible for improvements made through early intervention to decline after the intervention ends (Estes et al., 2015).

Teacher Outcomes

It is generally accepted that intervention research should include data on implementation fidelity. Such data can help to establish the extent to which the intervention was implemented as intended and thus whether its correct implementation was likely to have been responsible for any positive intervention effect (Ospina et al., 2008). The measurement of fidelity in community-based settings is especially important as it is common for fidelity to be compromised when an intervention is transferred from a more controlled clinical setting to a more natural, applied setting (Breitenstein et al., 2010; Chang, Shire, Shih, Gelfand, & Kasari, 2016). Research has demonstrated that child outcomes are impacted by implementation fidelity (Stahmer, Aranbarri, Drahota, & Rieth, 2017). Indeed, two of the included studies highlighted decreases in child performance corresponding with decreased levels of teacher fidelity (Kern & Aldridge, 2006; VanDerHeyden, 2002).

With respect to reporting on implementation fidelity, eight studies (50%) reported data related to this quality indicator. This number suggests a reporting improvement over time in that an earlier review by Wheeler, Baggett, Fox, and Blevins (2006) reported that only 18% of studies reported on implementation fidelity. Of the eight studies from the current review that did report on implementation fidelity, six studies reported positive results with teachers reaching and maintaining high levels of fidelity during the intervention. For the remaining two studies (Garfinkle & Schwartz, 2002; Kern & Aldridge, 2006), results were mixed with some teachers failing to reach high levels of fidelity and others requiring extra coaching to meet acceptable fidelity levels. Interestingly, although studies referred to acceptable and high levels of fidelity, there did not appear to be any clear consensus across studies regarding the level of performance required to reach each level. For example, in the study by Young et al. (2016), a mean fidelity rate of 73% was deemed to be high while in the study by VanDerHeyden et al. (2002) a mean fidelity rate of 72% was described as poor. Further, none of these eight studies provided a minimum standard of fidelity, that is the level of fidelity required to establish experimental control and/or ensure the effectiveness of the intervention.

Also of note was the absence of generalization and maintenance data for teacher fidelity across the included studies. Only one included study (6%) reported on the generalization of teacher behaviour to non-target activities and children (McBride & Schwartz, 2003). Results suggested that teacher fidelity improved from baseline but to a

lesser extent than the improvement seen with target activities and children. None of the included studies reported follow-up data for teacher fidelity. This type of data may be important in establishing teacher-delivered intervention as a feasible long-term option for early intervention for children with ASD. This is because a potentially valuable goal would be for community-based intervention to become largely self-sustaining, with teachers able to implement intervention with only minimal input from outside experts such as researchers. Indeed, the long-term feasibility and sustainability of interventions is an important consideration for any mental health-related intervention research study (Proctor et al., 2009) as current research suggests that many community-implemented interventions do not sustain over time (Dingfelder & Mandell, 2011)

Social Validity

Based on the quality rating scale used in this review (Goldstein et al., 2014), social validity refers to the educational or clinical significance of a study while consumer satisfaction refers to stakeholder's perceptions of the acceptability of the treatment or intervention. We use the term social validity as an umbrella term to encompass both of these aspects. Social validity is an important consideration in the implementation of interventions in community settings because of the well-documented research-to-practice gap (Drahota et al., 2012) and the recognized role of stakeholder perceptions in bridging this gap (Stahmer et al., 2017). Findings from the included study by Strain and Bovey (2011) suggested a high correlation (r = .89) between teachers' ratings of the social validity of the intervention and their implementation fidelity, further highlighting the potential importance of social validity. Indeed, in the Strain and Bovey study, teachers that viewed the intervention as socially valid were more likely to implement it with high levels of fidelity.

It is concerning then that only six studies (38%) included in this review met the quality requirements for acceptable measurement of social validity. All six of these studies reported overall positive results, suggesting that the interventions were viewed favorably by teaching staff. Of the remaining 10 studies, one study included a measure of social validity that was rated as "minimal" quality and the remaining 9 studies did not include any measure of social validity. Clearly, future research could be strengthened by greater attention to the assessment of social validity.

Limitations

Several limitations need to be considered with this review. Firstly, we limited included studies to peer-reviewed articles published in English, and as a result we may have missed studies that might have otherwise met the criteria for inclusion. Also, the exclusion of

unpublished work, such as theses and dissertations, may have increased the likelihood of no effects or negative results being excluded due to publication bias. Finally, included studies may have received different quality ratings if we had used an alternative framework to assess quality.

Implications

The results of this review would seem to suggest that teaching staff might be able to learn how to effectively deliver early intervention, with a reasonable degree of fidelity, to young children with ASD in inclusive preschool environments. However, many of the reviewed studies had minimally acceptable levels of quality based on the Goldstein et al. (2014) rating framework. Given the need for high-quality studies to guide evidence-based practice, the results of this review point to the need for additional and higher quality studies. At the present time, any statements regarding the effectiveness of the early interventions included in this review must be viewed as tentative. Further, the delivery of early intervention in these settings may improve outcomes for the participating children. Although these results suggest that a range of early intervention programmes can be effective when implemented in inclusive preschool settings, further research is needed to establish the generality of the findings of this review. Specifically, there is a need for more high-quality studies that evaluate the long-term effectiveness of interventions and the long-term maintenance of both child and teacher outcomes. These studies should also include assessment of the social validity as well as the long-term feasibility of use of the intervention for different communities (Dingfelder & Mandell, 2011). Alongside this broad long-term research agenda, smaller studies that examine the active components of intervention could be informative and may enable providers to make use of only those intervention components that are most likely to be necessary. Eliminating the use of inactive treatment components may reduce the costs and increase the efficiency of intervention efforts. Single-case research designs would seem well geared towards identifying the active ingredients of a given intervention, as well as for evaluating the generalization and maintenance of treatment effects (Lord et al., 2005; Ward-Horner & Sturmey, 2010).

There may also be value in future comparative research to determine which intervention approach or package, if any, is the most effective when delivered in an inclusive preschool setting. This type of research should also include a thorough assessment of the initial and ongoing costs of different intervention approaches as well as their acceptability to stakeholders (Dingfelder & Mandell, 2011). It may also be valuable to compare inclusive preschool-based delivery of interventions with one-on-one or specialist preschool delivery to

determine which mode of delivery is most effective. Future research should also include clearly defined child outcomes that are explicitly linked to the expected outcomes of the intervention being studied (Lord et al., 2005). It would be valuable for these outcomes to be measured with a consistent set of instruments across studies, to allow for future cross-study comparisons. Finally, future studies should include a clearly defined measure of implementation fidelity. Researchers might consider specifying a minimum level of acceptable fidelity. In line with this, future research that more closely examines possible links between implementation fidelity and child outcomes would seem of some value.

CHAPTER 3
OVERVIEW OF THE PRESENT RESEARCH
Purpose of the Research Project
Delivery of the G-ESDM in an Inclusive New Zealand Preschool

Intensive early intervention (EI) that is based upon behavioural principles has been established as efficacious in improving outcomes for young children with autism spectrum disorder (ASD; e.g. Dawson, 2008; Debodinance et al., 2017; Drahota, Aarons & Stahmer, 2012). However, for many communities accessing intensive intervention is problematic (Singh & Garrett, 2019). Some communities may also have limited or no access to ASD-specific early childhood education (ECE) options. One solution may be providing EI in an inclusive preschool setting. This seems to be a logical setting for EI delivery as many young children with ASD already attend inclusive preschools. Further, interventions for ASD increasingly emphasise a naturalistic approach, where EI is delivered in a child's everyday environment, alongside typically developing peers. It therefore seems logical to study the implementation of EI in a child's natural environment, such as the inclusive preschool that they regularly attend. Preschool teachers may be logical intervention agents for preschool-based delivery of EI and delivery by teachers is likely to be important to the long-term sustainability of the intervention.

A number of studies have demonstrated the feasibility of training regular preschool teachers to implement EI for ASD in an inclusive environment. Results from these studies also indicate that the delivery of EI generally led to improvements in child outcomes. The current research focusses on the G-ESDM, a comprehensive play-based intervention that seems to be well-suited to implementation in a preschool setting (Eapen et al., 2013). Indeed, results from several studies have indicated that preschool-delivered G-ESDM can lead to improvements in a range of outcomes for young children with ASD. One of these studies (Vivanti et al., 2018) compared delivery of the G-ESDM in an inclusive preschool setting with its delivery in an ASD-specific preschool. Results from this study suggest that G-ESDM can feasibly be delivered in an inclusive preschool setting, leading to improved outcomes for children with ASD.

However, there is evidence to suggest that some communities are not able to provide the same level of specialist input and dedicated resources that are typically available in intervention studies such as the one by Vivanti et al. (2018). This appears to be especially so for low-SES, ethnic minority (Ferraioli & Harris, 2011) and rural communities (Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007), and indeed for typical New Zealand

preschools. It may therefore be important to evaluate the feasibility and effectiveness of comprehensive EI, such as G-ESDM, when implemented in a preschool environment that more closely reflects the typical conditions in these communities. Indeed, there is a recognized need for the G-ESDM to be evaluated in research (Capes et al., 2019).

The key differences between the inclusive preschool in the Vivanti et al. (2018) study and typical New Zealand preschools are listed below:

- In New Zealand preschools, child-teacher ratios are likely to be significantly higher than the ratio of 4:1 in the Vivanti et al. (2018) study. It is also important to note that the maximum recommended child-teacher ratio for implementing G-ESDM is 4:1 (Vivanti et al., 2017) and it is not known whether it is feasible or effective to deliver the G-ESDM in a setting with higher ratios.
- In the Vivanti et al. (2018) study, intervention was delivered in designated ESDM preschools where the entire preschool was organised for the delivery of G-ESDM, as recommended in the G-ESDM manual (Vivanti et al., 2017). Many New Zealand preschools do not have the resources required to rearrange the preschool environment and daily schedule for the delivery of G-ESDM.
- Many New Zealand preschools do not have access to the level of teacher training provided in the Vivanti et al. (2018). Specifically, in the Vivanti study one staff member at each center was a certified ESDM therapist and all teaching staff received in-depth training and in vivo coaching concurrently.

The current research aims to address this gap in the literature by examining the effectiveness of the G-ESDM in an inclusive preschool setting that is more representative of typical preschools in some communities. Specifically, the intervention will be delivered in preschools with child-teacher ratios of up to 15:1 within the existing preschool environment and without altering regular preschool routines. Study 1 will evaluate whether it is feasible for a certified therapist to use ESDM strategies with fidelity as part of the regular preschool routine in this type of setting. Intervention effectiveness will also be evaluated via the measurement of a range of outcomes for the young children with ASD who receive the intervention. Results from Study 1 will be used as a foundation for Study 2 which will involve evaluating the feasibility of training teachers to use ESDM strategies in this type of setting. To address the logistical challenges associated with accessing specialist ESDM teacher training (e.g. lack of local certified ESDM therapists and high cost of specialised ESDM training), teachers in Study 2 will receive a modified version of the ESDM parent

coaching programme. Also, only one teacher from each preschool will participate in the coaching programme.

For Study 2, the social validity of the teacher coaching programme and the ESDM intervention will also be evaluated by systematically collecting teachers' perceptions through a questionnaire and in-depth interviews. The assessment of social validity could be useful in identifying factors that may facilitate or hinder implementation of evidence-based intervention programmes, such as the ESDM, in applied settings. Identifying such factors could be important, given the reported difficulty associated with translating evidence-based interventions into practice in community-based settings (Drahota, Aarons & Stahmer, 2012). The perceptions of preschool teachers regarding the benefits of, and barriers to, implementing an intervention may help to bridge this gap (Stahmer et al., 2017).

The proposed research will thus aim to answer the following questions:

Research Questions

Study 1:

Q1: Can a certified Early Start Denver Model (ESDM) therapist use ESDM techniques with a high degree of fidelity in an inclusive preschool environment, without undertaking any major changes to the regular preschool routines or environment?

Q2: For three preschool-aged children with ASD who are attending an inclusive preschool setting, will implementation of the ESDM by a trained therapist for 3 hours per week over 10 weeks lead to improvements in individually defined social and communicative behaviours for each child?

Study 2:

Q3: For three teachers working with children with ASD in an inclusive preschool setting, will participation in a coaching programme lead to improvement in their use of ESDM strategies?

Q4: Will teachers' participation in the coaching programme lead to increases in individually defined social communicative behaviours for a young child with ASD that they teach?

Q5: After completing the training process and using the ESDM strategies, will teachers rate the training process and intervention as acceptable and effective using the TARF-R and in-depth individual interviews?

Research Hypotheses

In line with the above research questions and based on my review of relevant literature, I have developed five hypotheses. These are that:

1. The certified ESDM therapist will be able to implement at least some of the ESDM procedures with fidelity in an inclusive preschool setting without making changes to

regular preschool routines or resources. However, there may be some procedures which cannot be implemented with fidelity due to the complex and unpredictable nature of the preschool environment.

2. The implementation of a modified version of the ESDM by a trained therapist for 3 hours per week over a 10-week term in an inclusive preschool setting will result in significant improvements in individually defined social and communicative behaviours for young children with ASD.
3. The coaching programme will be effective in improving teachers' use of ESDM techniques.
4. Teachers' use of the ESDM strategies will result in significant improvements in children's individually defined social and communicative behaviours.
5. After completing the training process and implementing the ESDM procedures, teachers will report that the coaching programme and the ESDM procedures are acceptable and effective, but they will also offer concrete suggestions for how the programme could be improved.

Methodological Overview

This thesis will consist of two empirical studies. The aim of Study 1 is to evaluate the effectiveness of ESDM procedures in increasing individually defined social and communicative behaviours in children with ASD when implemented by the researcher in an inclusive preschool setting.

Study 2 will evaluate the feasibility of using a modified version of the ESDM parent coaching programme to train preschool teachers to use ESDM procedures in an inclusive preschool setting. The research will also measure the impact of teachers' use of ESDM procedures on individually defined social and communicative behaviours for children with ASD. Teachers' perceptions regarding the acceptability and effectiveness of the training programme and the intervention will also be evaluated.

Research Design

Both studies will use a non-concurrent multiple-baseline across participants design (Harvey, May, & Kennedy, 2004; Watson & Workman, 1981). This design is well-suited to the current studies because it allows the flexibility necessary to work around the logistical constraints often associated with applied educational research, without compromising experimental control. In Study One the researcher will be the interventionist and the participants will be three children with ASD. In Study 2, participants will be three child-teacher dyads and participating teachers will be responsible for implementing the

intervention. Each study will include the following sequential phases: (a) pre-baseline, (b) baseline, (c) intervention, and (d) follow-up.

During pre-baseline for Studies 1 and 2, child demographic information will be collected via a demographic questionnaire (see Appendix D) administered to parents. Child adaptive behaviour will also be assessed by interviewing teachers using the third edition of the Vineland Adaptive Behavior Scales (Vineland-3; Sparrow, Cicchetti, & Saulnier, 2016). The purpose of this assessment is to provide an objective description of each child's level of adaptive behaviour functioning. For Study 2, teachers will also complete an entry survey (see Appendix H) which includes demographic questions and asks teachers to rate their level of experience, confidence, knowledge and skill in relation to teaching children with ASD.

For both studies, participants will complete a baseline phase during which weekly 10-minute play samples will be collected via video. The purpose of this baseline phase is to "(a) document a pattern of behaviour in need of change, and (b) document a pattern that has sufficiently consistent level and variability, with little or no trend, to allow comparison with a new pattern following intervention" (Kratochwill et al., 2010, p. 19). The length of baseline phase for each participant will be randomly selected before baseline data collection begins. To randomly select the length of baseline for each participant, the researcher will pre-determine three different lengths of baseline: (a) 3 sessions, (b) 4 sessions, and (c) 5 sessions. The researcher will then use a random number generator to select a number between 3 and 5 for each participant. The number selected for each participant will represent the number of sessions in that participant's baseline phase.

As much as practicable, baseline sessions will be conducted at the child's preschool at the same time and day of the week that intervention data will be collected. The only difference between baseline and intervention phases will be the introduction of the intervention. In this way, if there is a change in a dependent variable (DV) for all participants upon introduction of the intervention, we can infer that the intervention is responsible for the change in that DV.

Specific intervention and follow-up procedures are described separately for each Study in Chapters 4 and 5.

Dependent Variables

Child Dependent Variables (DVs). For both studies, the researcher will consult with family members and teachers for each participating child regarding the skills/behaviours to be targeted and/or measured during intervention. The researcher will also spend time observing the child playing at their preschool and then select child DVs and learning goals based on

these observations together with teacher and parent priorities. Where parent and teacher priorities are not easily operationalised, these will be included as teaching goals (not DVs).

Teacher Fidelity. For Study 2, the extent to which teachers use the ESDM procedures correctly (teacher fidelity), will be assessed via video observation. A 10-minute video recording will be collected each week (see Chapter 4 and Chapter 5 for a more detailed description of study procedures). A modified version of the ESDM fidelity rating scale (Rogers & Dawson, 2010) will be used to provide an overall rating of teacher fidelity for each video. The modified scale will include the same 13 categories of adult behaviour used in the original ESDM fidelity scale, however the detailed and often subjective descriptions of each item from the original scale will be replaced by more objective bullet points (see Appendix E). For example, the item 'motivation' will be summarised into the following three bullet points: a) the adult gave the child opportunities to choose, b) the child showed interest in the activity for the duration of the activity, and c) there were a mix of maintenance and acquisition tasks. Each item will be rated on a 5-point Likert-type scale where a score of 0 indicates that a teacher has not used that technique and a score of 4 indicates that the teacher has used the technique consistently. A score of 3 or 4 indicates that the teacher has used the technique usually (score of 3) or consistently (score of 4) and will be considered to indicate an acceptable level of teacher fidelity for that item.

Social Validity. Social validity refers to the extent that stakeholders view an intervention and its outcomes as acceptable (Carter & Wheeler, 2019). After the intervention phase in Study 2, the Treatment Acceptability Rating Form Revised (TARF-R; Reimers, Wacker, & Cooper, 1991) will be administered to participating teachers to assess their perceptions regarding the acceptability of the intervention. The wording of questions will be adapted to make the questionnaire suitable for use with teachers (see the adapted TARF-R, Appendix I). For example, the words "your child" will be replaced with "the child that you teach". This measure has been selected because it is commonly used in the assessment of treatment acceptability of interventions for individuals with developmental disabilities, has high internal validity (0.92; Carter, 2007) and has been used in existing ESDM social validity research (Ogilvie & McCrudden, 2017).

The TARF-R questionnaire consists of 20 items, each rated on a 7-point Likert-type scale. The 17 items designed to measure the total acceptability of the treatment are presented as six subscales: reasonableness, effectiveness, side-effects, disruptive/time, affordability, and willingness. The 3 remaining items assess the severity of the child's behaviours and teacher understanding of the intervention. Subscale scores are summed to provide a score for

each of the following scales: total acceptability, severity and understanding. A higher total acceptability score indicates a greater level of acceptability.

Data Analysis

Child DVs will be individually selected and defined for each child. Analysis of child DVs may vary depending on the specific behavioural goals identified for each child. For example, where the dependent variable is a continuous (e.g. engagement) or high frequency (e.g. vocalisations) behaviour, interval recording will be used. That is, each 10-minute video will be divided into 60 10-s intervals and each interval will be scored for the presence or absence of each DV. An overall percentage of intervals with each target behaviour present will be calculated by dividing the total number of intervals with the target behaviour by the total number of intervals (60) and multiplying by 100.

For Study One, child DV data will be graphed for each child across three phases: baseline, intervention and follow-up. For Study 2, data will be graphed in the same way but will also include data for teacher fidelity across the three phases. These graphs will be visually analysed for observable change in behaviour due to intervention. Visual analysis is commonly used to infer a functional relationship between independent and dependent variables in single-case research (Horner, Swaminathan, Sugai, & Smolkowski, 2012; Kratochwill et al., 2010; Ximenes, Manolov, Solanas, & Quera, 2009). Descriptive statistics will also be provided to strengthen and support the results of the visual analysis.

Effect size will be calculated using the Tau-U method (Parker, Vannest, Davis, & Sauber, 2011), using the following online calculator: http://www.singlecaseresearch.org/. The Tau-U method is considered to be superior to both regression and simple nonoverlap approaches to data analysis in single-case research (Parker, Vannest, Davis, & Sauber, 2011). Like regression, the Tau-U provides a complete measure that includes both trend and level but the Tau-U includes only minimum assumptions regarding data and allows for control of positive trends in baseline data.

The Tau-U method will generate a ‘d’ value which provides an indication of the likelihood that change occurred between baseline and intervention and between baseline and follow up. However, the Tau-U is not simply a nonoverlap coefficient, in fact it shares many similarities with the Mann-Whitney U test of group independence (Brossart, Laird, & Armstrong, 2018). Thus, a Tau-U value could be considered to represent the extent to which baseline data is independent of intervention/follow-up data. This provides an indirect indication of phase non-overlap (Brossart et al., 2018).

For Study One, the Tau-U for each of the child DVs will be reported as a measure of overall improvement between baseline and intervention and between baseline and follow up for each child. For Study 2, the Tau-U for the child DVs will be reported in the same way as Study One as well as a measure of overall improvement between baseline and intervention and baseline and follow up for each teacher. Vannest and Ninci's 2015 guidelines will be used to interpret effect sizes as small (≤ 0.20), moderate ($0.21 – 0.60$), large ($0.61 – 0.80$) or very large (≥ 0.81).

For both studies, pre-assessment and/or post-assessment data will be summarised using descriptive statistics. Additionally, for Study 2, the audio recordings of teacher interviews will be transcribed and then analysed using reflexive thematic analysis. The process described by Braun and Clarke (2019) and Clarke, Braun, Terry and Hayfield (2019) will be followed. Specifically, the researcher will gain a sense of the data by reading and rereading the interview transcripts before analysing the data for each of the following questions: (a) how did the teachers describe their experiences with the intervention; (b) how did teachers describe the impact of the intervention with respect to the children, themselves and others at the kindergartens; and (c) What challenges did the teachers experience with regard to the intervention? During this analysis, patterns will be identified for each question and used to generate codes which will then be organised into initial themes. Next, these themes will be checked against the data set to ensure that they accurately reflect the data. At this stage themes may be further refined or discarded. Once refined, the themes will be clearly defined and named and finally, findings will be written up. Memoing (Johnson & Christensen, 2012) will also be used throughout the analysis process to keep record of ideas and insights related to the data.

Ethical Considerations

Both studies received ethical clearance from the Health and Disability Ethics Committee (reference number 18/CEN/29/AM01; Appendix A). Parents of each participating child provided informed consent for their child's participation in the study. For Study 2, participating teachers also provided informed consent. See Appendix C for copies of parent and teacher information sheets and consent forms. Child assent was inferred by each child's apparent willingness to take part in the play activities during each intervention session. For Study 1, informed consent was also obtained from all teaching staff and parents of all other children who attended the same preschool as the participating child. This consent provided for the possible inclusion of the teachers/other children in the video recordings that were used to collect data for the study. For Study 2, teachers and children who were not

participants were provided with information on the study and provided with ‘opt-out’ consent forms.

Special consideration will be given to the vulnerable nature of participating children and care will be taken to consult carefully with families and keep them fully informed throughout the research process. Prior to each study commencing, the researcher will meet individually with the families of potential participants to explain the project and answer any questions that arise. Families will also be given the researcher’s contact details and invited to contact the researcher with any questions or concerns at any stage of the research process. For Study 2, the rights of teachers as participants will also be considered. The researcher will ensure that teachers are free to withdraw from the study at any time and that information provided by teachers will be kept confidential to the research team.

Finally, this project has been designed to provide direct value to participants. The teaching goals to be used during intervention will be determined in consultation with each child’s parents and teachers. This allows for the selection of socially valid behaviours for each child. Teachers will also be given opportunity to provide feedback on the training programme and intervention to inform future practice, this contribution to the field will be acknowledged. Detailed descriptions of the methods used in each of the two studies are provided in Chapters 4 and 5.

CHAPTER 4
STUDY 1: THERAPIST-DELIVERED ESDM IN AN INCLUSIVE PRESCHOOL SETTING

Chapter Note

This chapter has been published as a journal article in the *International Journal of Developmental Disabilities.* Full citation details for this article are provided on Page 5. Dr. Larah van der Meer, Dr. Hannah Waddington, and Professor Jeff Sigafoos provided input into design and assistance with data analysis, interpretation of results and editing. Aside from this input, this study was designed and conducted by me.

The original published article is included here in its entirety and only minor grammatical changes have been made. For example, American English spelling has been changed to New Zealand English.

Abstract

The Early Start Denver Model (ESDM) is a promising early intervention for promoting improved social, cognitive, and communication outcomes for young children with autism spectrum disorder (ASD). However, most studies evaluating group-based delivery of this programme have used 15–25 h per week of intervention in specialised ESDM preschools with low child–teacher ratios. Thus, the positive results from such studies might not be obtained when this intervention model is evaluated in more typical inclusive preschool settings. In this study, a low-intensity version of the ESDM was delivered to three young children with ASD in their regular inclusive preschool by a certified therapist who did not typically work at any of the preschools. The intervention procedures were implemented for 3 h per week over an 8- to 10-week period. Data were gathered on children's levels of participation, imitation, and communication from weekly 10-min video recordings. The effects of the intervention were evaluated using a multiple probe across participants design with 3 weekly follow-up probes, 3 weeks after the intervention ended. All participants showed improvement in active participation, imitation and either intentional vocalisations or spontaneous functional utterances. These results were generally maintained at follow-up. This low-intensity version of the ESDM would seem effective for use in real-world preschool environments.

Effects of a Low-Intensity Early Start Denver Model-based Intervention Delivered in an Inclusive Preschool Setting[3]

The distinguishing features of autism spectrum disorder (ASD) are difficulties in social-communication and the presence of restrictive or repetitive behaviours or interests (American Psychiatric Association [APA]; 2013). Many individuals with a diagnosis of ASD will require life-long support (Lord et al., 2018). Early intervention (EI) can lead to improved outcomes for young children with ASD (Debodinance et al., 2017). Currently, EIs that incorporate both behavioural and developmental aspects (naturalistic developmental behavioural interventions; NDBIs) appear to be the most widely used and are supported by a growing evidence base (Ospina et al., 2008; Tiede & Walton, 2019). NDBIs focus on incorporating teaching and learning into a child's everyday routines and thus are likely to be well-suited to implementation in children's natural environments (Tiede & Walton, 2019), such as at home or in an inclusive preschool setting.

Delivery of EI in an inclusive preschool setting might have several educational benefits. Specifically, inclusive environments may provide young children with ASD with opportunities to observe appropriate communicative and social behaviours and to practice these behaviours with their typically developing peers (Koegel, Koegel, Frea, & Fredeen, 2001; Vivanti et al., 2017). This would seem to be especially important given that a core feature of ASD is difficulty in social communication. Group-based delivery of EI may also be more efficient than individual intervention as it allows for delivery to more than one child at a time (Leaf et al., 2018). Inclusive preschool environments may also more closely represent the group-based teaching formats that children with ASD are likely to encounter when they reach school-age.

Further, there is increasing international commentary on the inclusion of children with disabilities, including ASD, in mainstream educational settings (Barton & Smith, 2015; Pellicano et al., 2018a). Within the field of early childhood special education, for example, it is generally accepted that when possible, children with ASD should be taught alongside typically developing peers in natural environments (Ledford & Wolery, 2011). The Division

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[3] Based on: Tupou, J., Waddington, H., van der Meer, L., & Sigafoos, J. (2020). Effects of a low intensity Early Start Denver model-based intervention delivered in an inclusive preschool setting. *International Journal of Developmental Disabilities.* doi:10.1080/20473869.2019.1707434

for Early Childhood (DEC) also recommends that EIs be embedded in children's typical routines and contexts (DEC, 2014). There are also legal imperatives for the provision of intervention in an environment with the least amount of restriction required to meet a child's needs and with ongoing opportunities for interaction with typically developing peers (Broderick, 2017; United Nations, 2006). Inclusive preschool environments would appear to satisfy these recommendations as they offer a natural environment with access to typically developing peers.

The intervention used in the present study is the Early Start Denver Model (ESDM), a comprehensive NDBI designed for use with children aged between 12 and 60 months (Rogers & Dawson, 2010). The model draws on earlier work from the Denver model (Rogers et al., 1986; Rogers & DiLalla, 1991) and makes use of a range of behavioural tactics, such as Pivotal Response Training (PRT; Koegel et al., 1999) within a relationship-focused developmental framework. The ESDM is a comprehensive intervention that can be delivered to children individually in many different contexts, and a group-based version of the ESDM (G-ESDM; Vivanti et al., 2017) allows for delivery to more than one child at a time.

The ESDM can be classed as a "promising" EI (Baril & Humphreys, 2017; Waddington et al., 2016) meaning that a number of studies have documented improved outcomes for children receiving ESDM therapy but there is not yet enough evidence for ESDM to be considered "evidence-based". G-ESDM has been evaluated across five studies to date (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2018). Participants across the five studies received 15 to 25 hours per week of group-based ESDM intervention at specialised ESDM preschools with teacher/therapist-child ratios of 1:3 (Vivanti et al., 2013; Vivanti et al., 2014) or 1:4 (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2018). In two studies (Eapen et al., 2013; Fulton et al., 2014) participants received an additional one-hour per week of one-on-one ESDM therapy.

For four of the G-ESDM studies, the intervention was delivered in autism-specific ESDM preschools (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2013; Vivanti et al., 2014). Collectively, results from these studies suggest that the ESDM was associated with improvements in child cognitive skills (Eapen et al., 2013; Fulton et al., 2014; Vivanti et al., 2013; Vivanti et al., 2014), various language/communication outcomes (Eapen et al., 2013; Vivanti et al., 2014), gross motor skills (Eapen et al., 2013), and reduced levels of challenging behaviour (Fulton et al., 2014). Eapen et al. (2013) also reported a significant decrease in participants' autism symptoms however, the remaining three studies reported no significant change in autism severity/symptoms.

The remaining G-ESDM study (Vivanti et al., 2018) compared outcomes of children with ASD who received ESDM in an inclusive preschool with those who received ESDM in a specialist ASD preschool. Participants from both groups demonstrated improvements across a range of outcomes including language/communication, social interaction, imitation, adaptive behaviour and ASD symptoms. There did not appear to be any significant difference between inclusive versus specialised delivery in terms of child improvements. The authors concluded that inclusive preschool-based delivery of ESDM is a feasible and potentially effective approach to early intervention for young children with ASD.

While results from the study by Vivanti et al. (2019) suggest that the inclusive preschool-based delivery of ESDM can improve outcomes for children with ASD, the study's setting may not be representative of typical preschools in many communities. Specifically, the child-teacher ratio at the preschools in Vivanti et al.'s study was 1:4 whereas in some communities ratios may be much higher. For example, in New Zealand preschools, child-teacher ratios may legally be as high as 1:15 (Education (Early Childhood Services) Regulations, 2008). A higher ratio is likely to mean that teachers have less time to dedicate to one-on-one and small group teaching and it is not known whether ESDM can be effectively implemented in settings with higher child-teacher ratios. Additionally, in the Vivanti et al. study, intervention was delivered in designated ESDM preschools where one staff member at each center was a certified ESDM therapist and all teaching staff received ESDM training and in vivo coaching throughout the study. Communities may not have access to this level of specialised staff or ongoing training, particularly in underserved areas such as rural and low-socioeconomic communities (Singh & Garrett, 2019). Research focused on ASD services that support underserved populations is a current priority in international autism research (Pellicano et al., 2018b). Consequently, it may be valuable to evaluate the delivery of ESDM in settings that more closely reflect the conditions in these types of communities. Indeed, the need for research that addresses the community viability of the G-ESDM has been recently acknowledged (Capes et al., 2019).

The current study took place in New Zealand, where there is no national disability insurance scheme and many families rely primarily on government-funded EI services. For many young children with ASD, these services are provided through the Ministry of Education and the child's local preschool. There is also a strong legal and social emphasis in New Zealand on providing services to children with disabilities in inclusive settings (Ministry of Education, 1996). Thus, inclusive preschool-based intervention would seem to make logical sense in a New Zealand context. The ESDM seems particularly well-suited to

implementation in New Zealand preschools because its emphasis on positive relationships, whole-child development, and child-centered learning mirrors three of the four principles that underpin Te Whaariki, the New Zealand preschool curriculum (Ministry of Education, 1996).

The main purpose of the present study was to evaluate whether it was feasible for a certified therapist to deliver ESDM intervention with a high degree of fidelity in a typical New Zealand preschool environment without the need for major changes to the environment or typical preschool routine. A second purpose was to evaluate the intervention's impact on the participation, communication, and imitation of the young children with ASD who participated in the present study. Finally, it is hoped that the findings from this study will help to inform future research focused on training regular teachers in similar inclusive preschool settings in the effective provision of early intervention to children with ASD.

Method

Ethical Clearance and Informed Consent

This study received ethical clearance from the New Zealand National Health and Disability Ethics Committee (Reference Number 18/CEN/29/AM01, see Appendix A) and was registered with the Australian New Zealand Clinical Trials Registry (ANZCTR; registration number 12618000324213). Parents provided written consent for their child's participation in the study. Child assent was inferred by the children's willingness to take part in the play activities**.**

Participants

Three children who met the following inclusion criteria were recruited from local preschools: (a) chronological age of 60 months or less at the start of the study, and (b) a clinical diagnosis of ASD. Children with other medical, genetic, neurological, or sensory conditions (e.g. Down syndrome or fragile X syndrome) were excluded, as were children who were receiving more than 10-hours per week of early intervention at the start of the study. Characteristics of the three participating children are summarised in Table 4.1. Demographic information was collected from the parents (see Appendix D for demographic questionnaire) and adaptive behaviour was assessed by interviewing teachers using the third edition of the Vineland Adaptive Behavior Scales (Vineland-3; Sparrow et al., 2016).

Table 4.1

Participant Demographic Characteristics and Vineland-III Results.

	Luke	Ian	Jordan
Age (years:months)	4:8	4:9	4:5
Gender	Male	Male	Male
Ethnicity	Pākehā	Filipino – Pākehā	Māori – Pākehā
Vineland-III			
Adaptive Behaviour Composite	41	70	58
Communication (sum of v-scale scores)	6	39	19
Percentile rank	<1	19	<1
Receptive	0:1	2:1	1:4
Expressive	0:5	2:5	0:11
Written	<3:0	6:4	3:6
Daily Living Skills (sum of v-scale scores)	11	22	20
Percentile rank	<1	<1	<1
Personal	1:7	2:6	1:11
Domestic	<3:0	<3:0	<3.0
Community	<3:0	<3:0	<3.0
Socialization (sum of v-scale scores)	15	23	20
Percentile rank	<1	<1	<1
Interpersonal Relationships	0:4	1:3	0:11
Play and Leisure	0:11	1:11	0:11
Coping Skills	<2:0	<2:0	<2:0
Motor Skills (sum of v-scale scores)	12	15	20
Percentile rank	<1	1	4
Gross Motor	1:7	1:5	2:8
Fine Motor	1:5	3:0	2:9

Luke. Luke (pseudonym) was a Pākehā (New Zealand European) boy. He was 4:8 (years:months) old at the beginning of the study. He received a diagnosis of ASD at 18 months by a clinical team who use the Autism Diagnostic Observation Schedule-2 (ADOS-; Lord et al., 2012) as part of the assessment process. Luke's Vineland-3 scores are displayed in Table 4.1. Luke was reported by his mother and teachers to occasionally use functional sounds and words. Prior to the start of the study, Luke had been provided with a simple core-vocabulary communication board, but his teachers reported limited success with this. Luke's teachers described him as a happy, affectionate boy who showed an interest in simple puzzles and shape sorters and loved to play on the swings and walk over the bridge in the playground. Luke was reported by his mother and teachers to engage in self-biting and biting others when frustrated. Luke was not toilet trained and appeared to have an aversion to wearing diapers. In addition to his time spent at the inclusive preschool, Luke spent 2.5 hours per week at a center-based preschool programme for families with young children with developmental delays. Each 2.5-hour session included a group music session as well as a 20-min session for each of four specialist therapies: music therapy, physiotherapy, speech language therapy and early intervention teaching.

Ian. Ian was a 4:9 boy of Filipino and Pākehā descent who had received a clinical diagnosis of ASD when he was 2.5-years old, from the same clinical team that diagnosed Luke. Ian's Vineland-3 scores are displayed in Table 4.1. According to Ian's parents and teachers, Ian spoke fluently, but his conversations were mainly limited to topics that he was interested in or replies to questions. Ian's teachers also indicated that Ian showed an interest in his peers but was often inappropriate in his social interactions (e.g., positioning his face and torso very close to his peers or interrupting activities by taking/pushing materials or making loud noises). According to Ian's parents and teachers, Ian showed a strong interest in reading and writing and could read and write a wide range of simple words independently. Ian was not receiving any early intervention outside of kindergarten, however the early intervention team from the Ministry of Education provided support and advice to Ian's teachers.

Jordan. Jordan was of Pākehā and Māori descent and was aged 4:5 at the beginning of the study. He was diagnosed with ASD at the age of 3-years by a clinical team from the same service that diagnosed Luke and Ian. Jordan's Vineland-3 scores are displayed in Table 4.1. Jordan's mother and teachers reported that he had a limited repertoire of functional words which he used irregularly (e.g., "ready, steady, go"). According to his preschool teachers, Jordan had recently begun to spontaneously sit in on group activities. He also

reportedly enjoyed music and would often sing. Jordan received 2.5 hours per week of intervention at the same center-based preschool programme as Luke.

Setting

Each child attended a different preschool. Each preschool consisted of a large open-plan indoor space with a carpeted ‘mat area’ and several smaller activity centers spread around the room. Materials at each activity center varied across sessions and preschools, but typically included playdough, art and craft, puzzles and a family corner with dress-up costumes, dolls, play furniture and play food. Children at each preschool also had free access to books, blocks, small, hand-held musical instruments, toy cars and trains. Each preschool had a kitchen, bathroom/toileting area, and outdoor spaces with sandpits, swings, monkey bars, trees, and a slide. Play materials included balls, sandpit toys (e.g. buckets and spades), ride-on toys (e.g. bikes and scooters) and water for play. Luke and Ian’s preschools both also included a small ‘forest’ area, complete with a playhouse and bridge at Luke’s preschool, and free-ranging chickens at Ian’s preschool.

The preschool that Luke attended offered five, 6-hour sessions per week and Luke attended for three four-hour sessions per week. The preschool was licensed for 40 children per session and was staffed by three qualified early childhood education (ECE) teachers, a part-time teaching assistant and an administrator. The activities that were frequently included in Luke’s intervention sessions were puzzles, playdough and outside play on the swings and playground.

Ian attended preschool along with his younger sister. The preschool offered five, 6-hour sessions per week, Ian attended all five sessions. The preschool was staffed by four qualified ECE teachers and a part-time administrator and was licensed for 43 children per session. Ian’s intervention sessions often included drawing, eating morning tea, dancing to music, and playing outside.

Jordan attended preschool for 6-hours, two days per week and for 4-hours a further two days per week. Days at Jordan’s preschool were divided into morning and afternoon sessions and all intervention sessions were conducted in the afternoon. Afternoon sessions included up to 30 children and were staffed by three qualified ECE teachers and a teaching assistant. The activities that were frequently included in Jordan’s intervention sessions were puzzles, blocks and outside play on the swings and playground.

Materials

An Apple iPhone, on a tripod, was used to videotape sessions. The ESDM manual (Rogers & Dawson, 2010), the group ESDM manual (Vivanti et al., 2017), and existing toys

and play materials from the preschools were used in the delivery of the intervention. Interventionist fidelity was measured using a modified version of the ESDM teacher fidelity rating scale (Rogers & Dawson, 2010; see Appendix E).

Dependent Variables

To select dependent variables, the first author met with each child's teacher(s) and parent(s) to gain feedback on possible target behaviours based on their knowledge of their child. The first author also spent 2-hours observing each child playing at their preschool and then selected target behaviours based on these observations together with teacher and parent suggestions. Due to the overlap in priorities across the different children, a set of common dependent variables (DVs) was selected for all participants and then individually adjusted as necessary, according to the developmental needs of each child. For example, all parents and teachers indicated that improving the child's expressive language was a priority and consequently all children had a DV related to improving expressive language. However, the specific expressive language target for each child was individualized. Luke's goal, for example, was to increase intentional vocalisations because it was not considered by the teachers and parents to be developmentally appropriate to target spontaneous functional utterances. In contrast, Ian's goal related to increasing spontaneous functional utterances and to be recorded, functional utterances had to be accompanied by eye contact. For Luke and Jordan's teachers and parents, a priority goal was for their child to correctly follow instructions. However, it was decided that this was too difficult to objectively measure as a DV and so it was instead included in each child's teaching goals. The operational definitions of each of the child dependent variables are presented in Table 4.2.

Table 4.2

Operational Definitions and Measurement of Each Child's Dependent Variables (Target Behaviours)

Target Behaviours:	Participant(s):	Definition:	Measurement:
Spontaneous functional utterances	Ian, Jordan	Any utterance by the child that: (a) occurred without adult prompting or modelling of the utterance within 10-s of its occurrence, (b) was clearly used to communicate to an adult or peer, (c) served a purpose that was contextually related and meaningful to the interaction and (d) contained a phonetically correct approximation of the correct word or word combination. In Ian's case, he also needed to be facially oriented towards the adult or peer to whom he was directing the utterance either immediately before, during or immediately after the utterance.	Partial interval recording (10-s intervals)
Intentional vocalisation	Luke	Any vocalisation by the child that: (a) occurred without adult prompting or modelling of the vocalisation within 10-s of its occurrence, (b) was related to the interaction and (c) did not contain a phonetically correct approximation of the word or word combination. Also, the vocalisation needed to be communicative, so the child needed to be at least partially oriented toward the adult/peer and the vocalisation needed to occur within 10-s of an adult/peer action or utterance or the child needed to appear to be making a request, rejection or comment (as evidenced by accompanying behavioural indicators such as reaching, pushing away, showing or pointing). Finally, whining, screaming, crying, laughing, unrelated speech, stereotypy and echolalia were not counted.	Partial interval recording (10-s intervals)
Imitation	Luke, Ian, Jordan	Performing an action with or without an object or performing a facial expression, within 10-s of an adult or peer model and without prompting from an adult.	Partial interval recording (10-s intervals)
Active Participation	Luke, Ian, Jordan	A child was considered to be 'actively participating' when they spent the whole interval: (a) facially oriented towards an adult or peer; (b) directing affect (smiling and/or laughing) toward an adult or peer; (c) looking in the direction that the adult or peer was pointing; (d) giving, sharing, or showing objects to an adult or peer; (e) imitating an adult or peer; (f) taking turns with an adult or peer; (g) following directions given by an adult or peer; (h) communicating with an adult or peer with words, vocalisations, and/or gestures; and/or (i) continuing or elaborating on an adult's or peer's play actions. Instances where the child was singing to him/herself or engaged in an isolated activity were not included.	Whole interval recording (10-s intervals)

Data Collection

Data on each child's target behaviour(s) were collected via 10-min video recordings of the target child in the preschool setting. This approach to data collection was consistent with existing ESDM research (e.g. Vismara & Rogers, 2008; Vismara et al., 2009; Vismara et al., 2012; Waddington et al., 2019) and was considered to be the most pragmatic approach to data collection given the nature of the research questions and the setting in which data was to be collected. Where practicable, videos for the intervention phase were taken at the same time and day each week, the video was always the first 10-min of the intervention session. Baseline and follow-up videos were taken at the same time and day as intervention videos for each child.

Research Design

The study was intended to follow a non-concurrent multiple-baseline across participants design (Harvey et al., 2004; Watson & Workman, 1981). This design was selected because it allowed the flexibility necessary to work around the logistical constraints often associated with applied educational research, without compromising experimental control. However, continuous data collection during baseline was not possible due to participant absences and changes in the preschool schedule. Consequently, the study design is perhaps best considered a multiple probe across participants (Kennedy, 2005). The study included the following sequential phases: (a) pre-baseline, (b) baseline, (c) intervention, and (d) follow-up.

The length of baseline phase for each participant was randomly selected before baseline data collection began, in line with the requirements of the nonconcurrent multiple-baseline design. To randomly select the length of baseline for each participant, the first and last authors pre-determined three different lengths of baseline: (a) 3 sessions, (b) 4 sessions and (c) 5 sessions. These authors then used a random number generator to select a number between 3 and 5 for each participant. The number selected for each participant represented the number of sessions in that participant's baseline phase.

Procedures

Pre-baseline. After administering the Vineland-3 (Sparrow et al., 2016), the first author informally observed target children during regular preschool routines and spoke with teachers and parents to determine a set of individualized ESDM teaching goals for

each target child, to be used during the intervention phase. The specific ESDM teaching goals for each child are presented in Table 4.3. These observations and discussions were also used to help inform the selection of child DVs. As a rule, DVs included broad behaviours that could be objectively measured whereas teaching goals were more specific and/or difficult to objectively measure as a DV. For example, individual teaching goals related to imitation focused on a specific type of imitation (e.g. imitating an action on playdough) whereas the DV for imitation was broad and encompassed multiple types of imitation.

Table 4.3

Individualized ESDM Goals for Each Child

Domain	Luke	Ian	Jordan
Receptive communication	Respond to a proximal point by looking and placing object in indicated location Look towards object when shown an object and told "Luke, look". Respond to instructions to "stop" or "wait" without prompt or gesture.	Follow 2 or more unrelated instructions in a novel context. Retrieve items using 2-3 multiple cues (e.g. size, quantity, colour).	Perform a 1-step routine instruction involving body actions (e.g. "sit down" or "come here") Respond to instructions to "stop" or "wait" without prompt or gesture.
Expressive communication	Vocalise with eye contact and/or gesture to request desired objects. "Ask" for help by handing object to an adult or verbalising or looking towards an adult.	Correctly respond to complex 'wh' questions (e.g. "what", "where", "who"). Correctly use 2 or more reflexive pronouns (e.g. "myself", "himself", "themselves").	Produce 6-10 single words or approximations within familiar routines or activities. Produce at least 3 verbs involving actions on self or objects associated with a play routine (e.g. "roll", "stop" or "push").
Social skills/ Joint attention	Use a motor prompt to initiate or continue a sensory social routine. Use eye contact while giving/taking objects from others.	Imitate novel songs/finger plays in group situations. Respond appropriately to simple requests/instructions from peers.	Respond to greeting by waving or saying "hi"/"bye" with 2-3 seconds of eye contact. Use eye contact while giving/taking objects from others.

Imitation	Imitate 8-10 one-step actions on objects. Imitate 10 visible motor actions inside song/game routines.	Imitate 8-10 one-step actions on objects. Imitate 10 visible motor actions inside song/game routines.	Imitate 8-10 one-step actions on objects. Imitate 10 visible motor actions inside song/game routines.
Cognition	Match/sort identical objects. Match/sort identical pictures.	Count objects with one-to-one correspondence to 10. Give "one", "some", "a lot", "a little", "all", "more" or "most" when requested by an adult.	Match/sort objects by size. Sort similar objects into like groups/categories (e.g. cars, horses or balls).
Play	Play independently and appropriately with 10 one-step toys. Demonstrate conventional actions on self with a range of objects (e.g. place phone to ear or comb hair).	Spontaneously link 3 or more related behaviours in a play theme. Direct partner (adult or peer) in play, using at least 3 relevant instructions.	Demonstrate conventional actions on self with a range of objects (e.g. place phone to ear or comb hair). Complete play activities and show some attempt to pack away/clean up.
Fine Motor	Imitate at least 5 simple actions with playdough (e.g. poke, roll or squeeze). Imitate drawing strokes, scribbles and dots with a crayon/marker.	Use scissors with appropriate grasp and use opposite hand to stabilise and turn paper. Use a tripod grasp with drawing tools.	Imitate drawing strokes, scribbles and dots with a crayon/marker. Snip paper with scissors (at least 3 snips).
Gross Motor	Roll a ball back and forth with another person. Imitate gross motor actions in a variety of positions (e.g. sitting, standing or moving).	Imitate gross motor actions in a variety of positions (e.g. sitting, standing or moving). Jump off a step and over objects on the ground.	Imitate gross motor actions in a variety of positions (e.g. sitting, standing or moving). Imitate gross motor actions with movement to songs/music.

Baseline. As much as practicable, baseline sessions were conducted at the child's preschool at the same time and day of the week that intervention data would be collected.

Each baseline involved a 10-min video-recorded session at the child's preschool. During each session, the first author waited until the child was involved in a play activity, then approached, greeted the child and positioned herself nearby, in the child's line of sight. During the 10-min session, the first author delivered an imitation or verbalisation/vocalisation probe approximately every 30s. The purpose of these probes

was to provide participants with equal opportunities to imitate and verbalise/vocalise across baseline and intervention sessions. An example of an imitation probe was stacking one block on top of another to make a tower and an example of verbalisation/vocalisation probe was greeting the child and pausing for a response. The first author did not provide any additional prompts or reinforcement and responded appropriately to any child approaches or initiations (e.g. if a child used a gesture or vocalisation to ask for a push on the swing, the first author would give the child a push).

Intervention. Intervention for each child began after the pre-determined number of baseline sessions, provided that the baseline appeared to be adequately stable. Stability was defined as a clear and predictable pattern of response across at least three consecutive data points, with little or no trend and consistent level and variability (Kratochwill et al., 2010). For all participants, baselines were adequately stable after the pre-determined number of baseline sessions, so no additional baseline sessions were deemed necessary. It was originally intended that each participant would receive 30-hours of intervention delivered over 10-weeks. However, the total number of hours of intervention varied across participants because of child absence due to illness and transition from preschool to primary school for Luke and Jordan. Luke received 23-hours of intervention across 8-weeks, Jordan received 24-hours of intervention across 9-weeks, and Ian received 27-hours of intervention across 10-weeks. Each intervention session typically lasted for 1-hour, however, for Luke, the last nine sessions were longer (range: 1.5 to 2-hours) due to him having missed sessions due to illness and transitioning to primary school.

It was intended that the intervention procedures would be embedded into typical preschool activities and thus the usual preschool environment, session structure, and materials were not altered from the usual arrangement of the setting. From the beginning of each session, the therapist (first author) followed the child's lead, that is, the child indicated the activity that they wanted to participate in (either verbally or physically) and the therapist joined them in that activity. Children's goals (see Table 4.3) were embedded into play activities and behavioural teaching techniques (e.g. the use of clear cues, contingent reinforcement, and least-to-most response prompting) were used to teach target skills/behaviours. In addition, the therapist modelled language by

narrating the child's actions, and verbally acknowledged all of the child's communicative attempts.

Peers were present during all intervention sessions and were frequently involved in the intervention. However, interactions with peers were not orchestrated by the interventionist and peers were not trained to participate in or mediate the intervention in any way. Instead, the interventionist aimed to encourage and facilitate naturally occurring interactions with peers. For example, when peers did something interesting (e.g. poured water into a hole in the sandpit), the interventionist encouraged the participating child to pay attention to and imitate and/or expand on the play action. Likewise, when a participating child did something interesting (e.g. a big jump onto a crash pad), the interventionist encouraged peers to pay attention to and imitate and/or expand on the play action. Where reinforcement was not provided by peers or the play action itself, the interventionist provided reinforcement through use of praise and positive affect. When a participating child was interacting with a peer, the therapist attempted to act as 'an invisible support' by standing behind the participating child and scaffolding the interaction using least-to-most response prompting, as recommended in the G-ESDM manual (Vivanti et al., 2017). For example, if one of Ian's peers asked him to pass an item at the craft table, the interventionist (positioned behind Ian), would use least-to most prompting to support Ian to follow the peer's request.

When a child's engagement with an activity became overly repetitive, the therapist felt that the learning opportunities had been exhausted or the child appeared to have lost interest, the therapist indicated that the activity was over, asked the child to pack away materials (where appropriate) and followed the child's lead into a new activity. Where the child did not indicate a choice of activity (i.e. was unoccupied for more than a minute), the therapist would present the child with a choice of two activities and wait for the child to choose between the two, prompting a response when necessary.

Follow-up. Three-weeks after the end of the intervention phase, follow-up data were collected for Ian and Jordan once per week for three-weeks. It was not possible to collect follow-up data for Luke because he transitioned to primary school immediately after his intervention phase ended. Follow-up data were collected under intervention conditions. That is, one 10-min video was recorded per week in which the therapist interacted with the target child using ESDM techniques, in the same manner as the

intervention sessions. After the second follow-up session, an additional 10-min video recording was collected under baseline conditions. That is, the therapist (first author) interacted with the child in the same manner as during the baseline phase.

Inter-observer Agreement

Inter-observer agreement (IOA) was assessed for each participant and each of the dependent variables. The first author (Tupou) coded all of the collected data and two independent observers coded the collected data for an average of 29% of the 10-min videos across each phase and for each participant. Both observers had completed the introductory and advanced ESDM training programmes. The first observer had an undergraduate degree in psychology and was responsible for coding data for IOA on imitation and active participation. This observer was blind to the purpose and phase of the research. The second observer, a Master of Educational Psychology Student, was responsible for coding data on intentional vocalisations and spontaneous functional utterances. This observer physically attended each session that she coded and observed it live, before later coding it from the video. This was because an awareness of the live context was found to be important when coding verbal/vocal DVs, due to the level of background noise present in the video recordings. For the first IOA session, the observer used the application, Behavior Observation Made Easy (Shekhtmeyster, 2017), a data recording mobile software application, to live-code the occurrence of vocal/verbal DVs. The percentage agreement for this session was 100%, however it was decided that the use of the app was unnecessary and future IOA coding for these DVs was conducted using the video recordings and data collection sheets.

Prior to collecting any data, the first author individually taught each observer to use the data collection sheets (see Appendix F) and explained the definition for each dependent variable. Once the observers indicated that they understood the definitions, they practiced coding three different videos of the first author working with a young child with ASD, who was not a study participant, and discussed any issues they had with the first author.

Interval agreement (Kennedy, 2005) was used to calculate IOA percentages. That is, any interval where the first author and the observer both recorded the presence of a target behaviour, or both recorded the absence of a target behaviour, was counted as an agreement. Conversely, any interval where one primary observer had recorded the

presence or absence a behaviour and the other (reliability observer) did not, was counted as a disagreement. The following formula was used to calculate the overall percentage of agreements for each session: Agreements/(Agreements + Disagreements) x 100%. Table 4.4 shows that the mean IOA for all participants and outcomes was between 84 and 98%.

Table 4.4

Mean IOA (and range) for Dependent Variables Across Participants.

	Luke	Ian	Jordan
Active Participation	84% (68 – 98%)	83% (72 – 93%)	84% (80 – 93%)
Intentional Vocalisations	90% (83 – 100%)	n/a	n/a
Spontaneous Functional Utterances	n/a	84% (78 – 95%)	93% (90 – 98%)
Imitation	97% (95 – 98%)	92% (88 – 98%)	98% (90 – 100%)

Procedural Integrity

A checklist of procedural steps was used to monitor procedural integrity during baseline and follow-up phases (see Appendix G). The first independent observer from the IOA checks, who was blind to the purpose and phase of the study, assessed procedural integrity (PI) by coding the videotapes for 26% of all baseline sessions and 33% of all follow-up sessions (range = 20 – 33%). PI was assessed using a checklist based upon the integrity checklist developed by Waddington (2018). The checklist described each step of the baseline/follow-up procedures and the percentage of PI was calculated using the following formula: Number of correct steps/Total number of steps x 100%. Mean PI for each phase and participant was 100%.

Implementation Fidelity

The intervention was implemented by the first author, who was a certified ESDM therapist at the time of the study. In order to become a certified therapist, she had successfully completed the ESDM introductory and advanced training workshops and had provided two videotaped submissions of herself delivering ESDM therapy that were assessed as being above the minimum fidelity threshold of 80% by a certified ESDM trainer. To assess the extent to which the therapist (first author) correctly used the intervention procedures, the same independent observer who conducted PI checks measured ongoing implementation fidelity using the modified ESDM fidelity checklist. The checklist included the same 13 categories of adult behaviour as the traditional ESDM fidelity scale. For the traditional scale, each category is accompanied by a detailed description of optimal performance of the behaviour for that category. However, many of these descriptions included more than one element of performance and/or were subjective. In order to make each description operational for research, and to allow for objective, consistent measurement across coders, the detailed descriptions from the ESDM manual were summarised into objective bullet points for each category. For example, the item 'motivation' was summarised into the following three bullet points: (a) the adult gave the child opportunities to choose, (b) the child showed interest in the activity for the duration of the activity, and (c) there were a mix of maintenance and acquisition tasks.

Implementation fidelity was assessed for 20 to 25% of intervention sessions for each participant. Mean fidelity was: 85% (range = 83 to 86%) for Luke, 93% (range = 87 to 98%) for Ian and 89% (range = 87 to 91%) for Jordan.

Data Analysis

Data from the video observations were analysed for child DVs using interval recording. Specifically, each 10-min video was divided into 60, 10-s intervals and each interval was scored for the presence or absence of each target behaviour. For each target behaviour, an overall percentage of intervals with the behaviour present was calculated using the formula: number of intervals with target behaviour present/total number of intervals x 100%. This data was then graphed for each child across all phases of the study. These graphs were visually analysed for observable changes in the trend, level and/or variability in child behaviour due to intervention. Visual analysis is commonly

used to infer a functional relation between independent and dependent variables in single-case research (Horner et al., 2012; Kratochwill et al., 2010; Ximenes et al., 2009). Descriptive statistics were also calculated to strengthen and support the results of the visual analysis.

Finally, an effect size was calculated using the Tau-U method (Parker et al., 2011), via an online calculator (http://www.singlecaseresearch.org/). The Tau-U method is considered to be superior to both regression and simple nonoverlap approaches to data analysis in single-case research (Parker et al., 2011) because it provides a complete measure that includes both trend and level with only minimum assumptions regarding data and the ability to control positive trends in baseline data. The Tau-U value represents the ratio of nonoverlapping pairs across phases and thus provides an indication of the likelihood that change occurred between the given phases as well as the trend of change (i.e. negative or positive). Vannest and Ninci's (2015) guidelines were used to interpret Tau-u values as small (≤ 0.20), moderate (0.21 – 0.60), large (0.61-0.80), or very large (≥ 0.81).

Results

Active Participation

Figure 4.1 shows the percentage of whole intervals containing active participation (AP) for Luke, Ian, and Jordan across baseline, intervention, and follow-up phases. There were no whole intervals of AP during Luke's baseline phase and the mean percentage of whole intervals containing AP during intervention was 32% (Tau-U baseline-intervention = 1). Visual analysis of Luke's graph shows an immediate increase in AP upon introduction of the intervention and a strong positive trend throughout the intervention phase.

For Ian, the mean number of whole intervals containing AP during baseline was 18.5%. During intervention this mean increased to 69% (Tau-U baseline-intervention = 1) and further increased to 74% during follow-up (Tau-U baseline-follow-up = 1). For the follow-up probe conducted under baseline conditions, 73% of whole intervals contained AP. Visual analysis indicated that Ian's levels of AP immediately increased upon introduction of the intervention and remained fairly stable across the entire intervention phase.

During Jordan's baseline phase the mean percentage of whole intervals containing AP was 9%. During intervention this increased to a mean of 47% of intervals (Tau-U baseline-intervention = 1). During follow-up, an average of 37% of whole intervals contained AP (Tau-U baseline-follow-up = 0.87). For the follow-up probe conducted under baseline conditions, 7% of whole intervals contained AP. Visual analysis of Jordan's graph shows moderately variable data with a slight positive trend during baseline, an immediate increase upon introduction of the intervention and more variable data with a fairly stable trend during intervention, and a slight positive trend during follow-up. The Tau weighted average for baseline-intervention AP for all participants was 1 ($p = 0$).

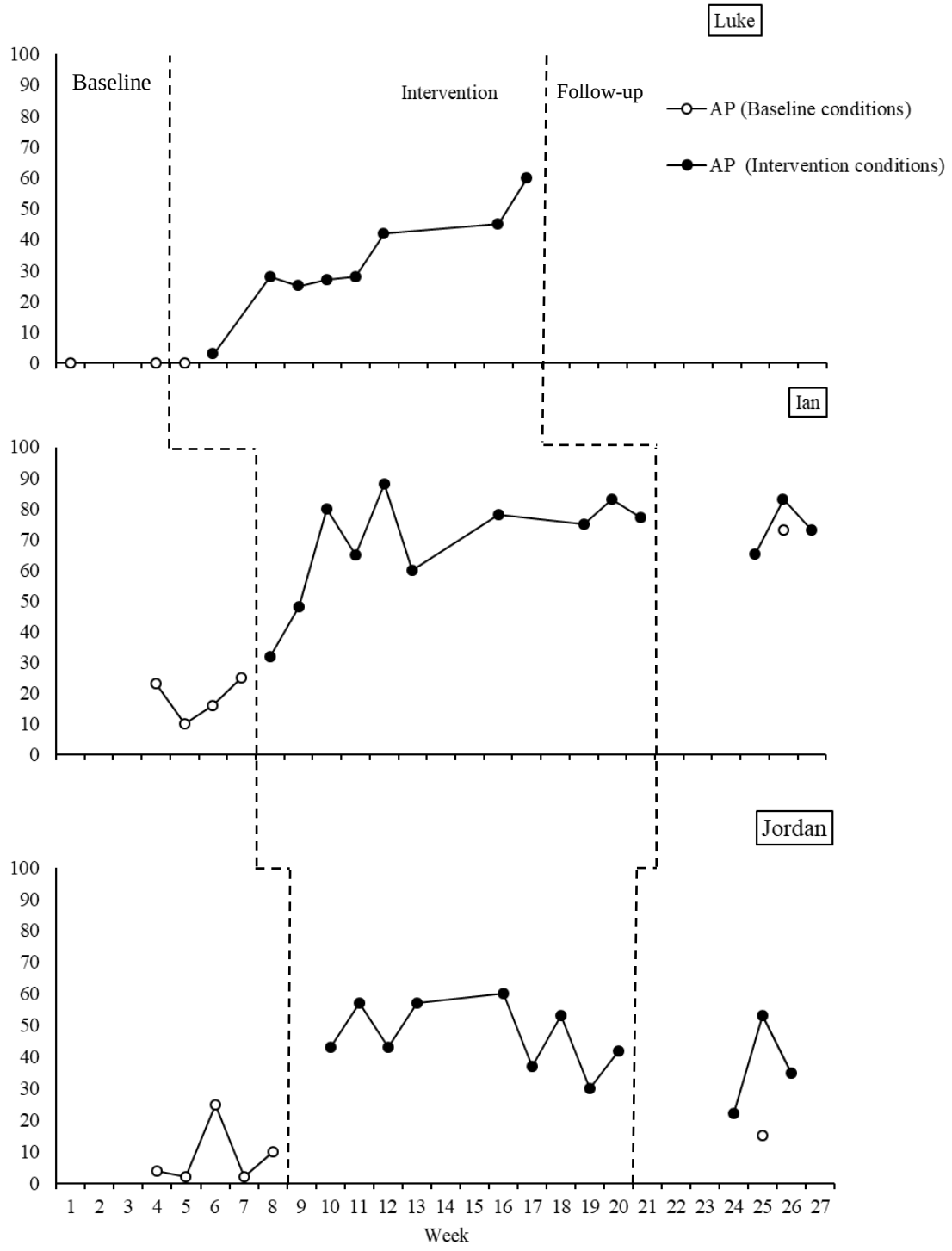

Figure 4.1. Percentage of 10-s intervals containing active participation for the whole interval.

Intentional Vocalisations and Spontaneous Functional Utterances

Figure 4.2 shows the percentage of partial intervals containing intentional vocalisations (IV) for Luke, and spontaneous functional utterances (SFU) for Ian and Jordan across baseline, intervention and follow-up phases. The mean percentage of intervals containing IV for Luke increased from 9% in baseline to 36% in intervention (Tau-U baseline-intervention = 1). Visual analysis indicates that the increase occurred immediately upon introduction of the intervention, data was moderately variable with a fairly stable trend during baseline and intervention.

During Ian's baseline phase a mean of 60% of intervals contained SFU and this increased slightly to a mean of 65% during intervention (Tau-U baseline-intervention = 0.23). During Ian's follow-up phase, the mean percentage of intervals containing SFU decreased to 57% (Tau-U baseline-follow-up = -0.25). During the follow-up probe conducted under baseline conditions, 52% of intervals contained SFUs. Visual analysis of Ian's graph indicates minimal variability during baseline with more variable data during intervention and a positive trend during follow-up.

During Jordan's baseline phase there was a mean of 7% of intervals containing SFU which increased to a mean of 25% during the intervention phase (Tau-U baseline-intervention = 0.96) and further increased to 27% during follow-up (Tau-U baseline-follow-up = 1). During the follow-up probe conducted under baseline conditions, 7% of intervals contained SFUs. Visual analysis of Jordan's graph indicates high levels of variability during both intervention and follow-up phases. The Tau weighted average for baseline-intervention SFU for Ian and Jordan was 0.6 (p = 0.01).

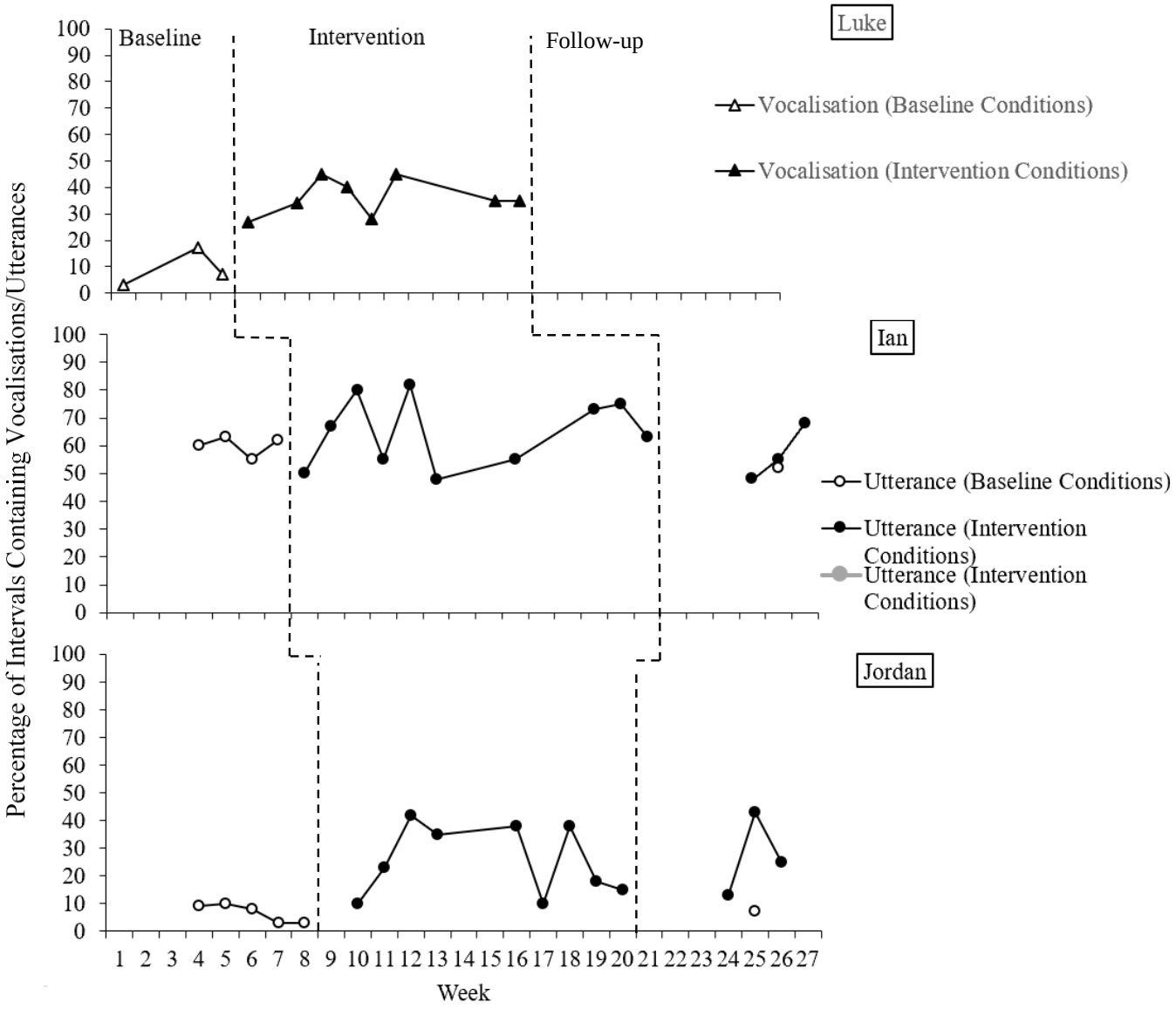

Figure 4.2. Percentage of 10-s intervals containing intentional vocalisations (Luke) or spontaneous functional utterances (Ian and Jordan).

Imitation

Figure 4.3 shows the percentage of partial intervals containing imitation for Luke, Ian and Jordan across baseline, intervention and follow-up phases. The mean percentage of intervals containing imitation during Luke's baseline phase was 2%. There was a minimal increase to a mean of 6% during the intervention phase (Tau-U baseline-intervention = 0.92). Visual analysis of Figure 3 indicates that there was minimal variability in baseline and intervention and a slight positive trend during intervention.

During Ian's baseline phase a mean of 1% of intervals contained imitation. This increased to a mean of 16% during intervention (Tau-U baseline-intervention = 0.98) and further increased to a mean of 18% during follow-up (Tau-U baseline-follow-up = 1). During the follow-up probe conducted under baseline conditions, 18% of intervals contained imitation. Visual analysis of Ian's graph indicates a positive trend during intervention and a negative trend during follow-up. Data was stable with minimal variability during baseline but was moderately variable during intervention and follow-up.

During Jordan's baseline phase a mean of 2% of intervals contained imitation. This increased to 7% during intervention (Tau-U baseline-intervention = 0.71). There were no intervals containing imitation during Jordan's follow-up phase (Tau-U baseline-follow-up = -0.6). During the follow-up probe conducted under baseline conditions, 2% of intervals contained imitation. Visual analysis of Jordan's graph indicates stable data during baseline and follow-up and a slight positive trend during intervention. The weighted Tau value for baseline-intervention imitation for all three participants was 0.86 ($p = 0$)

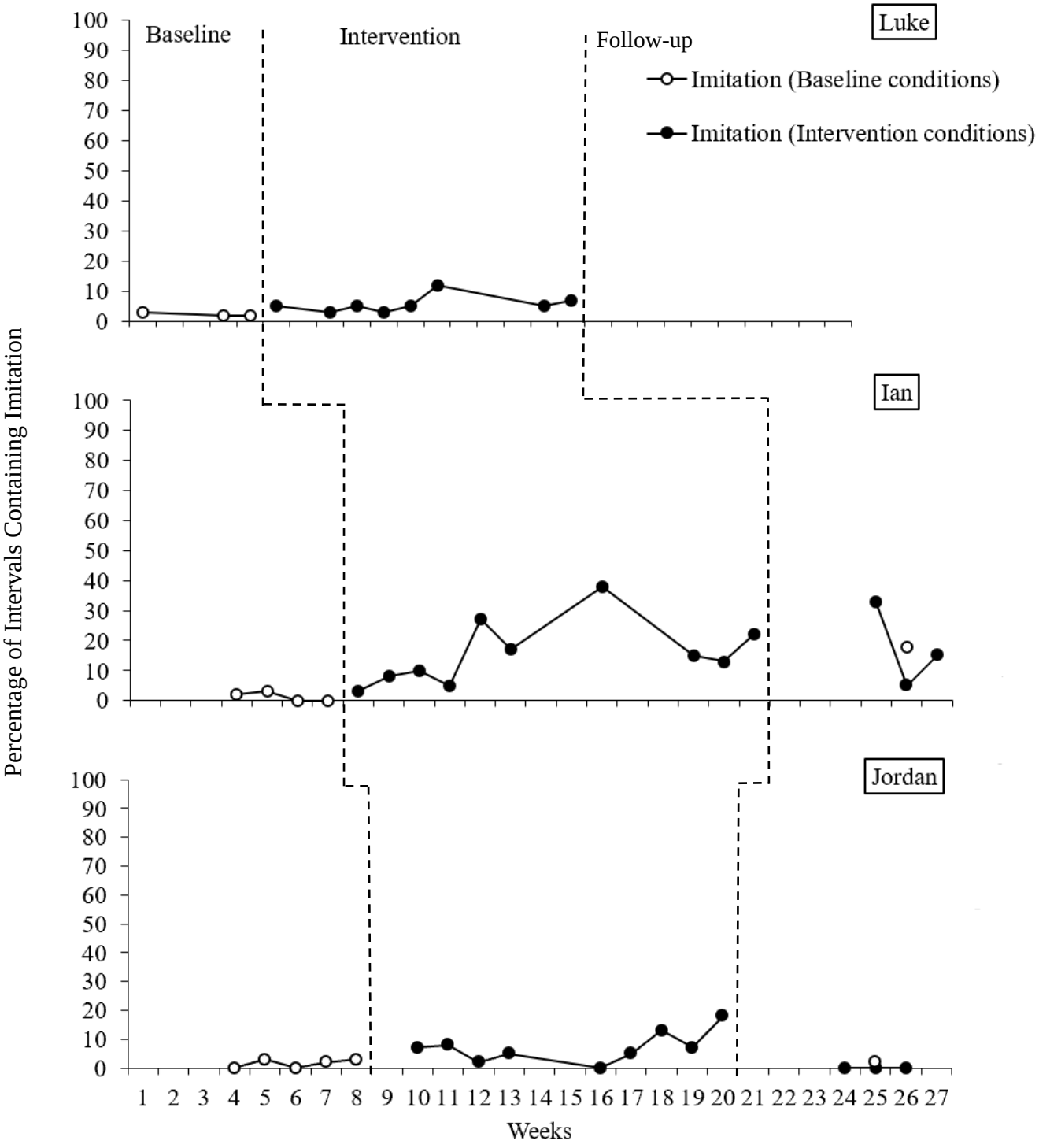

Figure 4.3. Percentage of 10-s intervals containing imitation.

Discussion

This study aimed to evaluate the effectiveness of inclusive preschool-based delivery of a low-intensity version of the ESDM. Three preschool-aged boys with ASD received three hours per week of intervention for 8- to 10-weeks. Intervention was delivered by the first author, a certified ESDM therapist, in the children's usual preschool settings. The author did not usually work at any of the preschools where the research was conducted. The results were generally positive for all three children. Specifically, the delivery of the intervention was associated with improvements in active participation, intentional vocalisations, functional utterances, and/or imitation for participating children. All children appeared to improve across two outcomes, however the specific improvements varied across children. For Luke, there were apparent improvements in active participation and intentional vocalisations with only a minimal improvement in imitation. Ian's active participation and imitation appeared to improve, and these improvements were maintained during follow-up. However, Ian appeared to make only minimal improvements in his use of functional utterances. For Jordan, active participation and functional utterances appeared to improve with improvements maintained during follow-up. However, Jordan's improvements in imitation appeared to be only minimal and were not maintained during follow-up.

Overall, the results point to the feasibility and effectiveness of an external certified therapist implementing ESDM therapy in a typical New Zealand inclusive preschool setting. These findings are consistent with previous evaluations of the preschool-based delivery of the ESDM and with a number of studies into the use of other early interventions for children with ASD in preschool settings (Eapen et al., 2013; Fulton et al., 2014; Tupou et al., 2019; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2018). The variation in outcomes observed across participants is also in line with previous studies as differences in treatment outcomes for children with ASD are well-documented (Zachor & Ben-Itzchak, 2017). However, direct comparisons across studies are problematic because of differences in child outcomes and the methods used to measure them.

Other studies of low-intensity ESDM delivered by certified therapists in a one-to-one format have reported similarly positive results on child outcomes (Colombi et al. 2018; Devescovi et al. 2016; Waddington et al., 2019). The study by Waddington et al.

used a similar design and child dependent variables to evaluate outcomes for four children who received three hours per week of one-on-one ESDM therapy in their homes. Participants from the Waddington et al. study showed greater improvements than those seen in the present study. This may indicate that, for the outcomes measured, ESDM is more effective when delivered in a one-on-one format in the home rather than a preschool environment that included relatively large numbers of children.

Although the child improvements in imitation were relatively minimal, it was interesting to note a positive trend during intervention for all participants. This positive trend may indicate that participants were indeed improving in their use of imitation, but that improvement was gradual rather than immediate. A longer intervention phase may have revealed an eventual significant improvement in imitation. Indeed, Ian's use of imitation further increased during follow-up, suggesting a continuing positive trend beyond his 10-week intervention phase. However, for Jordan the minimal gains in imitation made during intervention appeared to be lost during the follow-up phase. Further, the study by Waddington et al. (2019), used low-intensity ESDM delivered over a similar intervention period and reported greater improvements in child imitation than those found in the present study. It is possible that imitation is more difficult to teach in a group setting where control of materials is more challenging. However, it would be useful for future studies to include a longer intervention phase to examine whether greater gains in imitation might be made over a longer period of time.

A logical corollary to the generally positive results observed in the present study would seem to be training regular preschool teachers to use the intervention themselves. Indeed, there is currently a strong focus on implementing and studying evidence-based practices under "genuine circumstances" (Nahmias et al., 2019). Further, training teachers to implement interventions may broaden the reach of said interventions and allow more children with ASD or ASD-like symptoms to benefit from early intervention (Brian et al., 2017). However, there are likely to be additional challenges associated with teacher implementation of the intervention that may impact upon its feasibility for classroom implementation. Specifically, it may be difficult for teaching staff to deliver individualised instruction to children with ASD while they are also responsible for managing other children in the classroom. In classrooms with numerous children, teachers might not be able to deliver as much individualised instruction as a

designated therapist. It is therefore possible that low-intensity intervention delivered by an outside provider, as was used in the present study could be a practical delivery option. Nonetheless, future research should aim to evaluate the feasibility of teachers delivering the intervention themselves.

The present study has several limitations that merit discussion. First, data related to social validity were not collected because the intervention was implemented by a trained ESDM therapist and thus it was not clear that the preschool teachers would have had enough direct experience with the therapy to have provided useful social validation data. However, a consideration of social validity may be important for informing future efforts to train preschool teachers to use the present intervention themselves.

Likewise, the study is limited because we did not assess generalisation across people or settings. Unfortunately, it was not possible to assess generalisation due to logistical constraints, but clearly evidence of generalisation would strengthen the claim of effectiveness for the present intervention. Future research could include a measure of generalisation to regular teaching staff and peers and from the preschool to future primary school settings that the children enter at age five-years (in New Zealand).

Also, we did not measure the impact of the intervention on participating children's interactions with peers. Such a measure is likely to be important because part of the rationale provided for delivery in an inclusive setting is the presence of typically developing peers and the opportunities for interaction and communication that these peers may provide. Likewise, the scale used to measure interventionist fidelity did not specifically measure fidelity during peer interactions. It would seem important for future studies to include a measure of participating children's interaction with peers and for the fidelity scale to include a measure specific to interventionist fidelity during peer interactions. The fidelity scales in the G-ESDM manual (Vivanti et al., 2017) include items related to the facilitation of peer interaction and it may be useful for these items to be included in future studies. It may also be valuable for future research to provide a more detailed report on the involvement of peers during intervention sessions. This could include detail of the number of minutes per session that involved peers.

Finally, the results from this study cannot be generalised to all young children with ASD. This study had a small, limited sample size, and participants were all males aged between four and five-years old. Outcomes may vary for other subsets of

individuals with ASD such as females or younger children. However, there may be some generality to this intervention given that the three participants in the present study did have differing levels of adaptive behaviour (as evidenced by their Vineland scores) at the onset of the study. This would seem to suggest that the present intervention may be of value to a range of children with different levels of developmental functioning.

In conclusion, the results of this study suggest that a therapist-delivered programme of ESDM intervention led to improved outcomes for three preschool children with ASD. The strength of the study lies in demonstrating positive outcomes from a relatively low-intensity version of ESDM when delivered in inclusive preschool settings. However, the study is limited due to the absence of social validation, generalisation, peer interaction and long-term follow-up data. On the positive side, the present findings point to the feasibility of delivering effective early intervention to children with ASD in inclusive preschool settings, without having to make major adjustments to the preschool environment or classroom routines. A logical next step would seem to be training typical teaching staff to implement the intervention themselves, thus minimising the need for outside experts.

CHAPTER 5
STUDY 2: TEACHER COACHING BASED ON THE ESDM[4]

Chapter Note

This chapter has been accepted for publication in *Infants and Young Children*. Full citation details are provided on page 5. Dr. Hannah Waddington and Professor Jeff Sigafoos provided input into design and assistance with data analysis, interpretation of results and editing. Aside from this input, this study was designed and conducted by me.

The original manuscript has been included here in its entirety with only minor grammatical changes and additions made to that original text. Specifically, a paragraph on child dependent variables has been added on p.131, three paragraphs on teacher fidelity have been added on p. 143 – 144, Table 5.5 has been added on p.138 and further information has been added to the Discussion section on p. 148 - 149. All additions have been clearly marked with an asterisk. These additions were made to strengthen the article and to connect the article with the other thesis chapters. Also, it was not possible to include the information on teachers' use of individual strategies in the original article because of the strict word limit imposed by the journal where it was submitted for publication. However, this information was considered to add value to the overall thesis, particularly the general discussion in Chapter 7, so it has been included below.

Abstract

There is a need for research that evaluates the effectiveness of early intervention when delivered in inclusive preschools. In this study, three regular preschool teachers were trained to use the Early Start Denver Model with a child with ASD who attended an inclusive preschool. Each teacher worked with one child. Teachers received 11, 60-min coaching sessions based on an adapted version of the Early Start Denver Model's parent coaching programme. A multiple-baseline across participants design was used to evaluate effectiveness in terms of teachers' use of the early intervention strategies and children's levels of participation, imitation, and communication. Data were collected via

[4] Based on: Tupou, J., Waddington, H., & Sigafoos, J. (in press). Evaluation of a brief teacher coaching program for delivering an early intervention program to preschoolers with autism spectrum disorder. *Infants and Young Children*.

weekly 10-min video recordings with three follow-up probes conducted 11 weeks following intervention. Teachers improved in their use of early intervention strategies and children demonstrated improved levels of active participation, but results for child imitation and communication were mixed. Positive results were generally maintained at follow-up. This study provides preliminary support for the effectiveness and feasibility of using a modified coaching programme to train preschool teachers to use early intervention strategies from the Early Start Denver Model.

Introduction

Autism spectrum disorder (ASD) is a pervasive neurodevelopmental disorder characterized by difficulties in social communication and the presence of restricted or repetitive behaviours or interests (American Psychiatric Association, 2013). The prevalence rate of ASD appears to have increased over the past several decades and is now estimated at 1 in every 59 individuals (Baio et al., 2018). A corollary of this increase in prevalence rates is an increased need for service provision, including early intervention (EI). The benefits from EI have been established in a number of studies (Debodinance, Maljaars, Noens, & Van den Noortgate, 2017; Eldevik et al., 2009; Reichow, 2012; Vismara & Rogers, 2010; Warren et al., 2011). However, much of this research is derived from efficacy studies, that is, studies in which intervention was delivered by specialists under relatively structured conditions.

Given the well-documented research-practice gap in the field of ASD intervention research (Nahmias, Pellecchia, Stahmer, & Mandell, 2019), there would seem to be considerable value in undertaking effectiveness research in which EI is evaluated when it is delivered by regular teaching staff in the child's typical preschool environment. The need for effectiveness research stems in part from the possibility that interventions found to be efficacious may not be easily applied under more real-world conditions (Kasari & Smith, 2013) where specialist input and resources may not be readily available (Liptak et al., 2008; Singh & Garrett, 2019; Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007). Furthermore, there is an increasing focus on the use of naturalistic developmental behavioural interventions (NDBI; Tiede & Walton, 2019). It would therefore seem logical to evaluate such interventions when they are implemented by the usual support personnel operating within the child's natural environment.

Because many young children with ASD attend inclusive preschools, this may offer a logical setting for community-based delivery of EI. Preschool-based delivery may help to minimise the financial burden and demands on time that are commonly faced by families in attempting to access EI for their child (Nahmias, Pellecchia, Stahmer, & Mandell, 2019). There may also be cost savings associated with preschool-based delivery as there is the potential for intervention to be delivered to more than one child at a time (Leaf et al., 2018) using existing resources (e.g. teaching staff, play equipment and etc.). In addition, preschool teachers are likely to have useful specialised knowledge of teaching, learning and child development and, thus, seem well-suited to delivering EI.

The National Research Council on Autism Spectrum Disorders (2001) recommends that interventions for ASD should target the core deficits of ASD, these can be referred to as comprehensive interventions (Odom, Boyd, Hall, & Hume, 2010). The current study evaluates the delivery of a specific comprehensive intervention, the Early Start Denver Model (ESDM; Rogers & Dawson, 2010). The ESDM draws on earlier work from the Denver model (Rogers, Herbison, Lewis, Pantone, & Reis, 1986; Rogers & DiLalla, 1991) and Pivotal Response Training (PRT; Koegel, Koegel, Harrower & Carter, 1999) and is intended for use with children aged 12 to 60 months (Rogers & Dawson, 2010). It can be delivered in a one-to-one (Rogers & Dawson, 2010; Rogers, Dawson, & Vismara, 2012) or small-group format (Vivanti, Duncan, Dawson, & Rogers, 2017) and several studies have indicated that group-based ESDM (G-ESDM) can be effective in improving outcomes for young children with ASD (e.g. Eapen et al., 2013; Fulton et al., 2014; Tupou et al., 2020; Vivanti et al., 2013; Vivanti et al., 2014).

In a previous study by the present authors (Tupou et al., 2019), the ESDM was provided to three young children with ASD in an inclusive, community-based preschool setting. Intervention was delivered for 3 hours per week over 8 to 10 weeks. A multiple-probe across participants design indicated improvements in participation, imitation and/or communication for all children. These results suggested a low-intensity version of ESDM was feasible and effective for use in an inclusive preschool setting. However, the 3 hours of weekly intervention was delivered by a specially trained therapist.

Teacher delivery of EI may be more efficient and sustainable because it is likely to require less involvement from outside specialists.

In a recent review of research, Tupou, van der Meer, Waddington, and Sigafoos, (2019) found that teacher-delivered interventions consistently led to improved outcomes for young children with ASD in inclusive preschool settings. Strain and Bovey (2011), for example, found that teachers' use of the Learning Experiences and Alternative Program for Preschoolers and their Parents (LEAP) programme had a positive impact on participating children's autism symptom severity, cognitive development, language, social skills and problem behaviour. In another study, Young, Falco and Hanita (2016) found that teachers' use the Comprehensive Autism Program (CAP) had a positive impact on children's receptive language and social skills, but not their autism severity, adaptive behaviour, cognitive development or expressive language.

Of particular relevance to the present research is a 2019 study by Vivanti et al. which found that outcomes for young children with ASD receiving G-ESDM in an inclusive preschool were comparable to outcomes for young children with ASD who received the same intervention in an autism-specific preschool. This points to the feasibility and potential effectiveness of inclusive preschool-based delivery of G-ESDM.

However, the inclusive preschools involved in the above referenced studies may not be representative of preschools in other communities. Specifically, the preschools in these studies had child-teacher ratios of 3:1 (Young et al., 2016), 4:1 (Vivanti et al., 2018) or 5:1 (Strain & Bovey, 2011), yet many community preschools may have much higher ratios. For example, in New Zealand where the current study is set, ratios may legally be as high as 15:1 (Education (Early Childhood Services) Regulations, 2008). Higher ratios are likely to affect the amount of time that teachers are able to dedicate to one-on-one and small group teaching and, thus, may also affect the delivery of the intervention. Likewise, in each of the three studies, the entire staff of each preschool was trained to implement the focus intervention and each preschool was specifically arranged to deliver that intervention (Vivanti et al., 2018). Many community preschools do not have the resource required to provide in-depth training for all teachers concurrently and to rearrange their preschool to deliver a specific intervention.

While data suggest comprehensive EI programmes are feasible and effective when delivered in inclusive preschool settings, there is a need for further research under typical community preschool conditions. The present study sought to determine the impact of an 11-week coaching programme on teachers' use of ESDM strategies. Given the nature of the preschool context where this study is set, and the scope of the study, traditional ESDM training was considered to be prohibitively expensive (in both time and financial costs), so was not considered a feasible option. It was therefore determined that a modified version of the ESDM parent coaching programme (P-ESDM; Rogers et al., 2012) would be used to train teachers. A second aim was to examine the effect of teachers' participation in the coaching programme on the active participation, imitation and vocalisations of young children with ASD. Data were also collected on teachers' perceptions of the intervention programme and on the maintenance of child and teacher behaviour after the intervention had ended.

Method

Ethical Clearance and Informed Consent

This study received ethical clearance from the New Zealand National Health and Disability Ethics Committee (reference number 18/CEN/29/AM01; see Appendix A) and was registered with the Australian New Zealand Clinical Trials Registry (ANZCTR; registration number 12618000324213). Informed consent was obtained from parents of participating children and participating teachers. Child assent was inferred by each child's willingness to engage in the therapeutic play activities.

Participants

Three teacher-child dyads, representing a convenience sample, were recruited via a local kindergarten association. That association oversaw 19 individual kindergartens. The association's management team was approached by the researcher (first author) and affirmed that their member kindergartens would be willing to consider participating in the study. On behalf of the researcher, the association's management team then approached kindergartens that included eligible children to inform the teachers about the study. Teachers were provided with the researcher's contact details and interested teachers could then contact the researcher. Once contacted, the researcher met individually with interested teachers and with the parents of eligible children to provide further information on the study and seek informed consent. A total of three

teacher-child dyads, who were eligible to participate, provided consent and were therefore included in the study.

Participating teachers were registered with the Teaching Council of Aotearoa New Zealand and regularly worked with their respective child with ASD. Teachers' demographic information, listed under pseudonyms, is summarised in Table 5.1. Teachers all had bachelor's level teaching qualifications and 8 to 16 years (M = 11.3 years) of preschool teaching experience. One teacher (Bear) rated her experience in working with children with ASD as "low" whereas the other two teachers (Kelly and Helen) rated theirs as "moderate." None of the teachers had received any previous ASD-specific training.

Children met the following inclusion criteria: (a) chronological age of 60 months or less, and (b) diagnosis of ASD. Children with other medical, genetic, neurological, or sensory conditions (e.g. Down syndrome or fragile X syndrome) were excluded, as were children who had previously received ESDM therapy, or who were receiving 10 hours per week or more of any other type of EI. Parents provided demographic information and children's adaptive behaviour was assessed via teacher interviews using the third edition of the Vineland Adaptive Behavior Scales (Vineland-3; Sparrow, Cicchetti, & Saulnier, 2016). Child demographics and Vineland-3 scores are summarised in Table 5.2.

Table 5.1

Teacher Demographic Characteristics and Entry Survey Results.

	Kelly	Helen	Bear
Participating child	Ricky	Tama	Anaru
Gender	Female	Female	Female
Ethnicity	NZ European	NZ European	NZ European
Qualification	Bachelor's Degree	Bachelor's Degree	Bachelor's Degree
Teaching experience (years)	8	10	16
Experience with ASD	Moderate	Moderate	Low

Table 5.2

Participant Demographic Characteristics and Vineland-III Results.

	Ricky	Tama	Anaru
Age (years:months)	3:6	4:11	4:8
Gender	Male	Male	Male
Ethnicity	Fijian Indian	Māori-Niuean	Māori
Vineland-III			
Adaptive Behavior Composite	49	42	41
Communication (sum of v-scale scores)	16	3	5
Receptive	0:0	0:11	0:9
Expressive	0:0	0:4	0:7
Written	3:4	<3:0	<3:0
Daily Living Skills (sum of v-scale scores)	13	19	13
Personal	0:8	2:4	1:3
Domestic	<3:0	<3:0	<3:0
Community	<3:0	<3:0	<3:0
Socialization (sum of v-scale scores)	15	13	13
Interpersonal Relationships	0:1	0:4	0:3
Play and Leisure	0:0	0:4	0:9
Coping Skills	<2:0	<2:0	<3:0
Motor Skills (sum of v-scale scores)	15	17	19
Gross Motor	1:5	3:4	3:0
Fine Motor	1:6	0:5	2:2

Ricky. Ricky, a Fijian-Indian boy, was aged 3:6 (years:months) at the beginning of the study. He received a diagnosis of ASD at the age of 3 years based on the Autism

Diagnostic Observation Schedule (ADOS; Lord et al., 2012). Ricky was minimally verbal and occasionally used functional sounds and words.

Tama. Tama was a Māori-Niuean boy aged 4:11. He received an ASD diagnosis at 4 years of age based on the ADOS (Lord et al., 2012). Tama was minimally verbal and showed infrequent use of a limited range of functional single-word utterances.

Anaru. Anaru was a Māori boy aged 4:8. He was diagnosed with ASD at the age of 3 years based on the ADOS (Lord et al., 2012). Anaru was minimally verbal and made infrequent use of functional sounds.

Context and Setting

New Zealand early childhood education context. Early childhood education (ECE) is not compulsory in New Zealand. However most New Zealand children attend some form of ECE before entering primary school (Education Counts, 2019). ECE services can be run by teachers, parents, and/or families and are often managed by non-profit community groups or private/corporate entities (Tyler-Merrick et al., 2018). The New Zealand education system emphasizes inclusion and almost all New Zealand preschools are inclusive in the sense of including and welcoming children with disabilities. ECE in New Zealand is partially funded by the government with additional learning support for children with disabilities and other diverse learning needs provided by the Ministry of Education. Learning support staff from the Ministry work collaboratively with teachers and families to develop and implement support plans for children with disabilities and other diverse learning needs. Approximately 4% of New Zealand children under the age of 5 years receive such support (Shuker, & Cherrington, 2016).

Preschool setting. All three preschools shared a similar layout and were similarly resourced. Each preschool consisted of a large open-plan indoor space with a large carpeted ‘mat area’ and several smaller activity centres spread around the room. Outdoor spaces all included a large sandpit, swings and trees. Each preschool offered five 6-hour sessions per day. Tama and Anaru’s preschools were staffed by four qualified ECE teachers and were licensed for 40 children per session. Ricky’s preschool was staffed by three qualified ECE teachers and was licensed for 30 children per session. Ricky attended his preschool for three, 4-hour sessions per week, Tama

attended for five, 6-hour sessions per week and Anaru attended for four, 6-hour sessions per week.

Materials

An Apple iPhone® was used to videotape sessions and to provide video feedback to teachers. Immediately after each session, videos were transferred onto a password protected storage device then deleted from the iPhone. This storage device was stored in a locked filing cabinet in the researcher's office. Handouts based upon information from the ESDM parent coaching manual (Rogers, Dawson, & Vismara, 2012) were used in the weekly coaching sessions. These handouts contained a summary of information from the corresponding chapter of the parent coaching manual. The summary included visuals to illustrate new strategies and practical examples of the use of the strategies in the kindergarten setting. Teachers used existing toys and play materials from the preschools to deliver ESDM to participating children.

Dependent Variables

Teacher fidelity. Teacher fidelity, which refers to the extent to which teachers correctly used the ESDM techniques and procedures, was assessed for each video. A modified version of the ESDM fidelity rating scale (Rogers & Dawson, 2010) was used to provide an overall rating of teacher fidelity for each video. The scale was modified by the first two authors to make it more operational for research (see Appendix E). The modified scale included the same 13 categories of adult behaviour used in the original scale: (a) management of child attention, (b) use of the ABC teaching format, (c) use of behavioural teaching techniques, (d) management of child arousal levels, (e) management of unwanted behaviours, (f) promoting dyadic engagement, (g) optimising child motivation, (h) use of positive affect, (i) sensitivity and responsivity, (j) use of multiple and varied communication, (k) use of appropriate language, (l) use of joint activity structure, and (m) managing transitions. However, the detailed and often subjective descriptions of each item from the original scale were summarised into more concise and objective bullet points. For example, the item "management of transitions" was summarised into the following bullet points: (a) when the child finished an activity, the adult quickly gave him/her a choice of a new one, and (b) the child performed physical transitions independently. This resulted in a total of 30 items across the 13 categories of adult behaviour. Each of these items was rated on a 5-point Likert-type

scale where a score of 0 indicated that a teacher had not used that technique and a score of 4 indicated that the teacher had used the technique consistently. A score of 3 or 4 indicated that the teacher had used the technique usually (score of 3) or consistently (score of 4) and was considered to indicate an acceptable level of teacher fidelity for that item. An overall fidelity score for each video was determined by calculating the percentage of items that were scored 3 or 4 for that video. It should be noted that one limitation of the current literature is that currently there does not seem to be any evidence regarding the validity or reliability of either the original rating scales or the modified rating scales.

Child variables. *As stated in Chapter 3 of this thesis, it was originally intended that child dependent variables (DVs) would be individually determined and defined for each child. However, given that a common set of DVs was used for children in Study 1, it was decided that these same DVs would be used in the present study.

Data were collected on each child's use of intentional vocalizations and imitation and their active participation. Definitions of each DV are presented in Table 5.3. Each 10-min video was divided into 60, 10-s intervals and interval recording (Kennedy, 2005) was used to measure DVs. For intentional vocalisations and imitation, partial interval recording (Kennedy, 2005) was used and each 10-s interval was scored for the presence or absence of each DV within that interval. For active participation, whole-interval recording (Kennedy, 2005) was used to record whether a child demonstrated active participation for the entire 10 s of each interval. For each DV, an overall percentage of intervals with the DV present was calculated using the formula: Number of intervals with DV present/total number of intervals x 100.

* This paragraph was not included in the original published article.

Table 5.3
Operational Definitions and Measurement of Each Child's Dependent Variables (Target Behaviours).

Target Behaviours:	Definition:	Measurement:
Intentional vocalisation	Any vocalisation by the child that: (a) occurred without adult prompting or modelling of the vocalisation within 10-s of its occurrence, (b) was related to the interaction and (c) did not contain a phonetically correct approximation of the word or word combination. Also, the vocalisation needed to be communicative, so the child needed to be at least partially oriented toward the adult/peer and the vocalisation needed to occur within 10-s of an adult/peer action or utterance or the child needed to appear to be making a request, rejection or comment (as evidenced by accompanying behavioural indicators such as reaching, pushing away, showing or pointing). Finally, whining, screaming, crying, laughing, unrelated speech, stereotypy and echolalia were not counted.	Partial interval recording (10-s intervals)
Imitation	Performing an action with or without an object, performing a facial expression, or producing a vocalization within 10-s of an adult or peer model and without prompting from an adult.	Partial interval recording (10-s intervals)
Active Participation	A child was considered to be 'actively participating' when they spent the whole interval: (a) facially oriented towards an adult or peer; (b) directing affect (smiling and/or laughing) toward an adult or peer; (c) looking in the direction that the adult or peer was pointing; (d) giving, sharing, or showing objects to an adult or peer; (e) imitating an adult or peer; (f) taking turns with an adult or peer; (g) following directions given by an adult or peer; (h) communicating with an adult or peer with words, vocalisations, and/or gestures; and/or (i) continuing or elaborating on an adult's or peer's play actions. Instances where the child was singing to him/herself or engaged in an isolated activity were not included.	Whole interval recording (10-s intervals)

Social Validity

After the intervention phase, teacher perceptions regarding the acceptability of the intervention were measured using the Treatment Acceptability Rating Form Revised (TARF-R; Reimers, Wacker, & Cooper, 1991). The TARF-R consists of 20 items, each scored on a seven-point Likert-type scale. Seventeen items across the following six subscales relate to the acceptability of the intervention: (a) reasonableness, (b) willingness, (c) affordability, (d) side effects, (e) effectiveness, (f) disruption/time. Two further items relate to the severity of child difficulties and the remaining item addresses respondents' understanding of the intervention. Subscale scores were summed to provide a score for each of the following scales: total acceptability, severity and understanding. A higher total acceptability score indicated a greater level of acceptability. The wording of the items was changed by the researcher to make the form suitable for use with teachers (see the adapted TARF-R in Appendix I). For example, the phrase "your child" was replaced with "the child that you teach." The TARF-R was selected because it has been used in previous research evaluating the social validity of the ESDM (Ogilvie & McCrudden, 2017; Waddington, van der Meer, Sigafoos, & Bowden, 2020) and has demonstrated high internal validity (Carter, 2007) and reliability (Finn & Sladeczek, 2001).

Data Collection

To maintain consistency with previous ESDM research (e.g. Tupou et al., 2020; Vismara & Rogers, 2008; Vismara, Young, & Rogers, 2012; Waddington et al., 2019a; Waddington et al., 2019b), data on teacher fidelity and child DVs were collected via 10-min video recordings. This was also considered to be the most pragmatic approach to data collection given the nature of the research questions and settings in which data were collected. Where practicable, all videos were taken at the same time and day each week for each child. During the intervention phase, the video was taken during the 10-min practice portion of the coaching session. No video was taken during the first week of coaching.

Research Design

A non-concurrent multiple-baseline across participants design was used. We chose this design because it allowed us the flexibility needed to work around the logistical constraints often associated with applied educational research, without

compromising experimental control (Harvey, May, & Kennedy, 2004; Watson & Workman, 1981). The study included the following sequential phases: (a) pre-baseline, (b) baseline, (c) intervention, and (d) follow-up.

The length of baseline phase for each participant was randomly selected before baseline data collection began. To randomly select the length of baseline for each participant, the researcher pre-determined three different lengths of baseline: (a) 3 sessions, (b) 4 sessions and (c) 5 sessions. The researcher then used a random number generator to select a number from 3 to 5 for each participant. The number selected for each participant represented the number of sessions in that participant's baseline phase.

Each participant had the pre-determined number of baseline sessions, provided that the baseline appeared to be adequately stable. Stability was defined as a clear and predictable pattern of response across at least three consecutive data points, with little or no trend and consistent level and variability (Kratochwill et al., 2010). For Kelly and Ricky and Bear and Anaru, baselines were adequately stable after the pre-determined number of baseline sessions, so no additional sessions were necessary. For Helen and Tama, an additional baseline session was necessary to establish a stable baseline.

Procedures

Pre-baseline. Parents provided demographic information on their child (e.g., age, gender, and ethnicity) via a demographic questionnaire (see Appendix D). Teachers also completed an entry survey that was developed by the researcher (first author) specifically for this study (see Appendix H). The survey included demographic questions for the teachers (e.g., age, gender, ethnicity, qualifications, and teaching experience) and asked teachers to rate their level of experience, confidence, knowledge and skill in relation to teaching children with ASD.

Each child was also assessed using the third edition of the Vineland Adaptive Behavior Scales (Vineland-3; Sparrow, Cicchetti, & Saulnier, 2016), which was administered via teacher interviews. The researcher (first author) conducted these interviews with each teacher at the kindergarten where they worked prior to beginning the baseline phase. The purpose of this assessment was to provide an objective description of each child's level of adaptive behaviour functioning.

After completing the Vineland-3 (Sparrow et al., 2016), the researcher spent time at each preschool observing target children during regular preschool routines and

spoke with teachers and parents of target children to determine a set of individualized ESDM teaching goals for each target child to be used during the intervention phase. The goals were used from Week 4 of the intervention phase to guide the focus of the coaching sessions and to inform teachers' work with the target children. For example, during the coaching session focused on speech, the coach and the teacher discussed the target child's expressive communication goal and how the strategies from that week's coaching session could be used to target that specific goal.

The development of goals was guided by the ESDM curriculum checklist, which is a comprehensive list of skills organised into developmental domains and sequenced according to the order that skills usually emerge in typically developing children. The checklist is used to determine a child's current level of development for each of the following developmental domains: (a) receptive communication, (b) expressive communication, (c) social skills, (d) imitation, (e) joint attention, (f) play skills, (g) cognitive skills, (h) fine motor skills, (i) gross motor skills, and (j) adaptive behaviour skills. Using this checklist, teaching goals are set just beyond the child's current developmental level, at the next step in development.

In traditional ESDM, children are typically assigned 2 to 3 goals per domain (for a total of 20 to 30 goals). However, for the current study, teachers selected a total of 10 goals for each child. Goals were written using the same structure as traditional ESDM goals. For example: "During play activities, when an adult places or holds a desired object out of Anaru's reach, Anaru will make a sound together with eye contact or a gesture (e.g. reaching for the object) to request the object. Anaru will do this for four out of five opportunities, across three sessions and with two different adults/settings."

Baseline. Each baseline session was a 10-min video-recorded session of the participating teacher and child interacting in the regular preschool environment alongside the other teachers and children at the preschool. During each session, the researcher asked the teacher to interact with the child as she usually would. The regular preschool environment was not altered in any way and no feedback or coaching was provided. At the end of the baseline phase and prior to the start of the intervention phase, the researcher delivered a 1-hour PowerPoint presentation to all the teaching staff at each preschool. The presentation provided an overview of ASD and the ESDM but did not include any information on specific ESDM strategies.

Intervention. The coaching programme used in this study was based upon the P-ESDM (Rogers et al., 2012). Each week a new topic was introduced, with each topic based around a chapter from the P-ESDM manual (Rogers et al., 2012). During weeks 1 to 5, the following topics were presented in the same order for all teachers: (a) attention, (b) sensory social, (c) joint activity routines, (d) teaching new behaviours, and (e) managing unwanted behaviours. From weeks 6 to 10, teachers could choose the order in which each of the following topics was delivered: (a) non-verbal communication, (b) imitation, (c) play, (d) joint attention, (e) speech. During the final week, a summary was provided, and the teacher and researcher reviewed the child's goals and set new goals as appropriate. For Bear and Anaru, techniques for dealing with unwanted behaviour were briefly explained during a practice session in Week 2 when Anaru displayed challenging behaviour and Bear requested support from the researcher.

Each coaching session included the following elements: (a) greeting and checking-in; (b) initial play session with child (practicing last week's skill; used as 10-min video); (c) teacher reflection on initial play session; (d) researcher reflection on initial play session; (e) introduction of new topic for the week; (f) second play session with child (practicing new skill); (g) teacher reflection on second play session; (h) researcher reflection on second play session; and (i) closing. However, on Week 5 (managing unwanted behaviours), teachers did not practice the new skill because participating children did not display any challenging behaviours. Teachers were instead offered a general practice session, all three teachers declined this offer. At the beginning of the intervention phase, the researcher also offered to meet with the families of the target children to share information on their child's goals and the ESDM strategies being used with their child at preschool. Ricky and Anaru's families both agreed.

The ESDM procedures were intended to be embedded into typical preschool routines and activities, within the regular preschool environment. ESDM techniques that the teachers were asked to use included: (a) using positive affect, (b) narrating child actions, (c) using language that is just beyond the language that the child is currently using, (d) acknowledging and responding to all child communicative attempts, (e) providing clear cues, (f) elaborating on child play ideas, (g) providing choices and (h) using people games/songs to help regulate child arousal levels. An example of an ESDM play activity in the preschool setting is presented in Figure 5.1. Teachers were

encouraged to practice using the techniques outside of the coaching sessions, as part of their regular teaching practice, but this was not monitored in the present study.

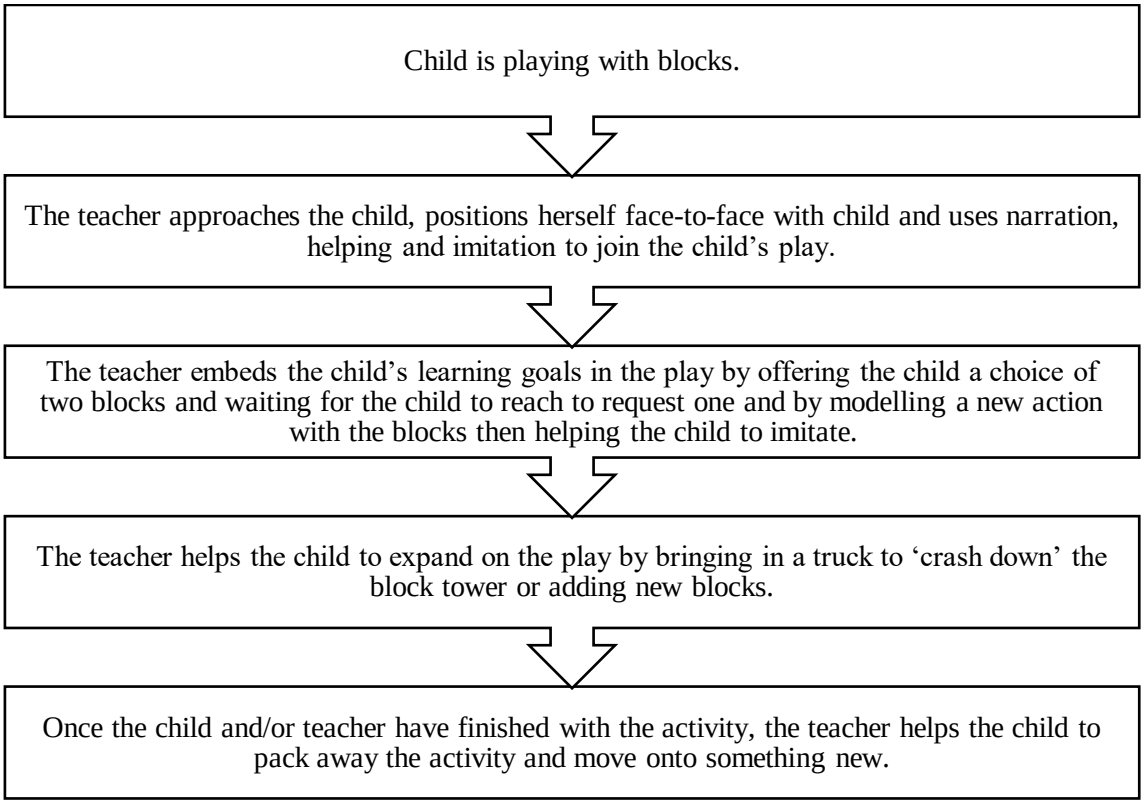

Figure 5.1. Example of an ESDM play activity in the preschool setting.

Post-intervention. Teachers completed the TARF-R (Reimers, Wacker, & Cooper, 1991; see Appendix I) and an exit survey that was developed by the researcher (first author) specifically for this study (see Appendix J). The exit survey asked teachers to rate their level of experience, confidence, knowledge and skill in relation to teaching children with ASD.

Follow-up. Follow-up data were collected under baseline conditions. That is, one 10-min video was recorded per week in which the teacher was asked to "interact as usual" with the target child and no coaching was provided. At the end of the 10-min video, the session concluded, and the researcher left the preschool. For Helen and Tama, one follow-up probe was conducted one month after the end of the intervention phase. No further follow-up data could be collected because Tama transitioned to primary

school. For the remaining dyads, three follow-up probes were conducted over 11 weeks following the end of the intervention phase.

Inter-observer Agreement

Inter-observer agreement (IOA) was assessed on data coding of child DVs and teacher fidelity. The first author (Tupou) coded all of the collected data and an independent observer coded the data for an average of 24% (range = 22 – 25%) of the 10-min videos across each phase and each participant. The observer had an undergraduate degree in psychology, had completed the introductory and advanced ESDM training programmes and was blind to study purpose and phase.

Prior to collecting any data, the researcher (first author) explained the definition for each dependent variable to the observer and demonstrated how to use the data sheets (see Appendix F). Once the observer indicated that she understood the definitions, she practiced coding videos of the researcher working in a preschool setting with a young child with ASD who was not a study participant. Practice continued until the researcher and observer reached at least 80% agreement across all DVs. According to Horner et al.'s (2005) quality indicators for single-subject research, 80% is the minimum acceptable level for IOA.

Interval agreement (Kennedy, 2005) was used to calculate IOA percentages for child DVs. That is, any interval where the researcher and the observer both recorded the presence of a target behaviour, or both recorded the absence of a target behaviour was counted as an agreement. Conversely, any interval where one observer recorded a behaviour and the other did not was counted as a disagreement. For IOA checks on teacher fidelity data, an agreement was recorded when both observers scored an item as usually/consistently (a score of 3 or 4), or when both observers scored an item lower than usually (a score of 0, 1 or 2). The following formula was used to calculate the overall percentage of agreements for each variable for each session: Agreements/(Agreements + Disagreements) x 100%. Table 5.4 shows the mean IOA for all participants and behaviours.

Table 5.4

Mean IOA (and range) for Dependent Variables Across Participants.

	Kelly & Ricky	Helen & Tama	Bear & Anaru
Teacher Fidelity	83% (77 – 87%)	80% (73 – 90%)	76% (73 – 83%)
Child Dependent Variables			
Active Participation	81% (78 – 85%)	81% (73 – 92%)	90% (75 – 97%)
Intentional Vocalisations	96% (83 – 100%)	91% (88 – 95%)	94% (88 – 100%)
Imitation	96% (88 – 100%)	96% (93 – 100%)	97% (93 – 100%)

Procedural Integrity

Baseline and follow-up sessions. To monitor the procedural integrity (PI) of baseline and follow-up sessions, a graduate student who had completed the advanced ESDM training course administered a specifically-developed checklist (see Appendix K), based on the checklist developed by Waddington et al. (2019a) for their study of parent-implemented ESDM. The checklist included items such as "researcher did not provide any coaching or feedback to the teacher" and was administered for 20 to 100% (M = 30%) of baseline and follow-up sessions for each participant.

Intervention sessions. Teacher coaching for this study was delivered by the first author, who at the time of the study was a certified ESDM therapist, but had not completed any formal parent/teacher coaching training. PI for the intervention sessions was assessed using another specifically-developed checklist that described each essential element of the coaching procedures (see Appendix L). These elements were based on the coaching procedures described in the ESDM parent coaching manual (Rogers & Vismara, 2015). The same graduate student who conducted the PI checks for baseline and follow-up sessions, randomly selected and attended one intervention

session for each participant and administered the PI checklist. Each of the three sessions coded for PI was focussed on a different strategy.

The percentage of PI for each phase was calculated using the following formula: Number of correct steps/Total number of steps x 100%. PI for baseline and follow-up was 100%. Mean PI for intervention was 88% (two sessions were 100%, for the third session PI was only 65% because the child did not return from a school visit so the practical part of the session could not be assessed by the observer. All other elements of this coaching session were scored at 100%).

Data Analysis

Data for teacher and child outcomes were graphed across three phases: baseline, intervention, and follow-up. Graphs were visually analysed for observable changes in behaviour due to intervention (Kratochwill et al., 2010) and descriptive statistics were calculated to support the visual analysis. The Tau-U method was used to calculate effect size (Parker, Vannest, Davis, & Sauber, 2011). Tau-U values represent the ratio of nonoverlapping pairs across phases and thus provide an indication of the likelihood that change occurred between phases as well as the trend of change (i.e. negative or positive). Vannest and Ninci's (2015) guidelines were used to interpret Tau-u values as small (≤ 0.20), moderate (0.21 – 0.60), large (0.61 – 0.80) or very large (≥ 0.81).

Results

Teacher Fidelity

Figure 5.2 shows the percentage of ESDM techniques that were used with an acceptable level of fidelity (scored as usually/consistently) for each teacher and each phase. For Ricky's teacher Kelly, the mean percentage of techniques implemented with an acceptable level of fidelity increased from 51% in baseline to 67% during intervention (Tau-U = 1) and further increased to 71% in follow-up (Tau-U = 1). Visual analysis of Kelly's graph indicates a relatively stable trend with no variability in baseline, an immediate increase upon introduction of the intervention and moderate variability during intervention and follow-up.

Tama's teacher Helen implemented a mean of 41% of techniques with an acceptable level of fidelity during baseline. This increased to 71% during intervention (Tau-U = 1) then decreased slightly to 70% during follow-up (Tau-U = 1.4). Visual analysis of Helen's graph indicates moderate variability during baseline with a clear

positive trend for the first two data points and a steady negative trend for the remaining three data points. There is an immediate increase upon introduction of the coaching intervention with minimal variability and a slight positive trend during intervention.

For Bear, the mean percentage of techniques implemented with an acceptable level of fidelity increased from 39% in baseline to 55% during intervention (Tau-U = 0.72) and further increased to 60% during follow-up (Tau-U = 1.27). Visual analysis of Bear's graph indicates a stable trend with minimal variability during baseline. Bear's first intervention data point is below baseline levels however there is a strong positive trend and by the third data point, levels are higher than baseline levels, except for one outlying data point at week 20. Bear's follow-up data indicate a slight decreasing trend.

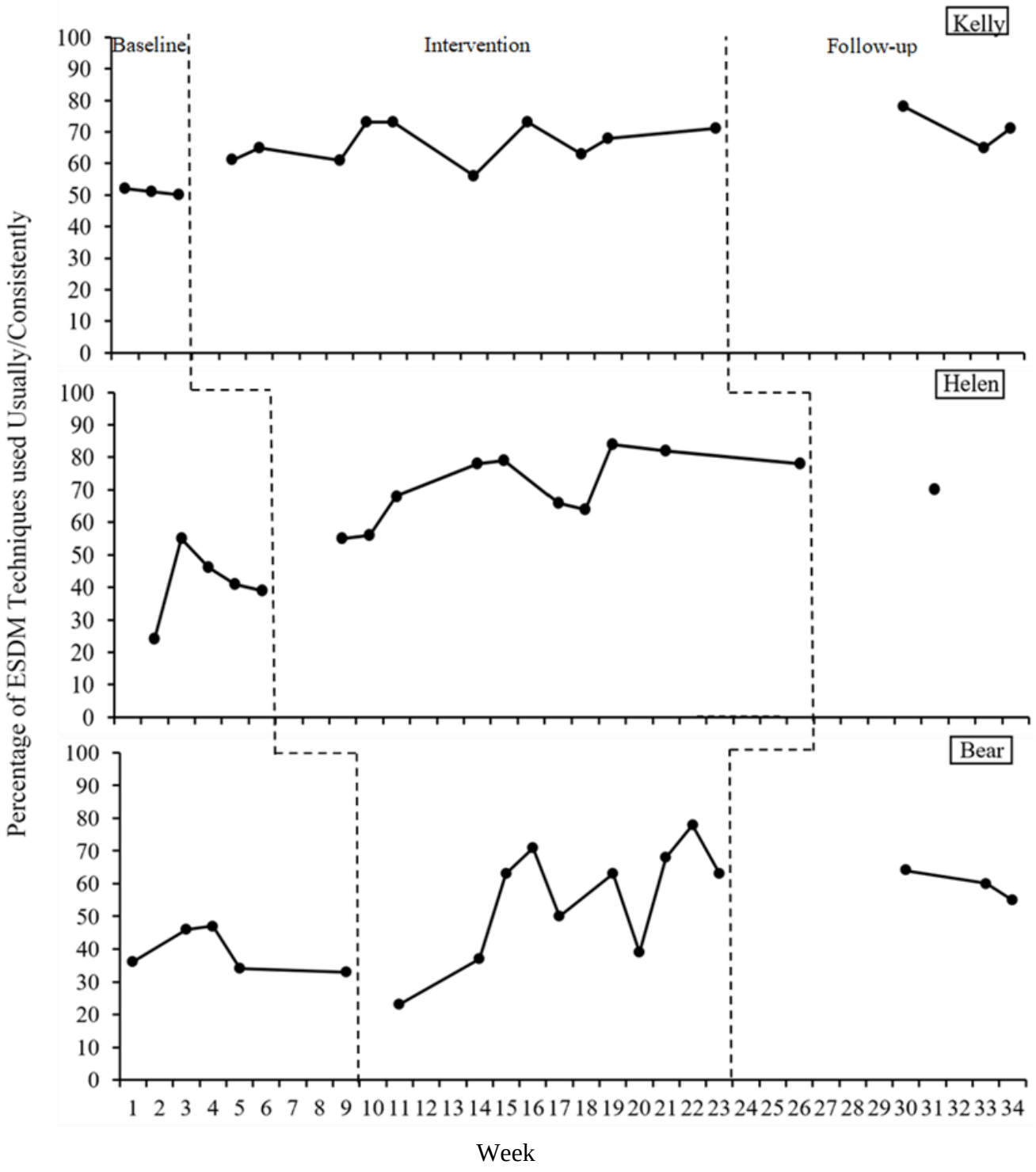

Figure 5.2. Percentage of techniques implemented ‘usually’ or ‘consistently’ by teachers

* Table 5.5 shows the extent to which teachers used each individual ESDM fidelity item as intended, that is with fidelity. It also shows changes in average fidelity levels for each item and teacher between baseline and intervention phases. The items that Kelly used with the highest mean levels of fidelity during intervention were modulation of affect and arousal, positive affect and sensitivity and responsivity. The items that she used with the lowest mean levels of fidelity during intervention were instructional techniques, transition between activities and joint activity structure. Kelly showed the biggest positive baseline to intervention change in management of attention and the smallest baseline to intervention change in optimising motivation.

The items that Helen used with the highest mean levels of fidelity during intervention were modulation of affect and arousal, positive affect and multiple and varied communication. The items that Helen used with the lowest mean fidelity levels during intervention were instructional techniques, transitions and joint activity structure. Helen showed the biggest positive baseline to intervention change in management of attention and the smallest baseline to intervention change in instructional techniques.

The items that Bear used with the highest mean levels of fidelity during intervention were modulation of affect and arousal, positive affect and sensitivity and responsivity. The fidelity items with the lowest mean intervention scores for Bear were dyadic engagement, instructional techniques and transitions between activities. Bear showed the biggest positive baseline to intervention change in joint activity structure and the smallest baseline to intervention change in appropriate adult language.

* The following three paragraphs were not included in the original article.

* Table 5.5.

Average teacher fidelity scores (and change in fidelity) for baseline and intervention phases for each fidelity item.

Fidelity Item	Kelly		Helen		Bear	
	Baseline	Intervention	Baseline	Intervention	Baseline	Intervention
Management of attention	11	85 (+74)	7	76 (+69)	20	50 (+30)
ABC format	33	57 (+24)	20	66 (+46)	33	50 (+17)
Instructional techniques	0	33 (+33)	17	31 (+14)	13	32 (+19)
Modulation of affect and arousal	100	100 (n/c)	100	100 (n/c)	100	100 (n/c)
Management unwanted behaviour	100	90 (-10)	80	80 (n/c)	100	70 (- 30)
Dyadic engagement	33	63 (+30)	14	72 (+58)	0	27 (+27)
Optimising motivation	55	56 (+1)	33	59 (+26)	33	43 (+10)
Positive affect	100	100 (n/c)	80	100 (+20)	100	90 (-10)
Sensitivity and responsivity	100	100 (n/c)	53	82 (+29)	40	79 (+39)
Multiple varied communication	17	50 (+33)	20	85 (+65)	0	45 (+45)
Appropriate adult language	55	62 (+7)	20	82 (+62)	40	47 (+7)
Joint activity structure	11	41 (+30)	20	44 (+24)	7	58 (+51)
Transition between activities	33	33 (n/c)	33	33 (n/c)	22	33 (+11)

* This table was not included in the original published article.

Active Participation

Figure 5.3 shows the percentage of whole intervals containing active participation (AP) for Ricky, Tama, and Anaru across baseline, intervention, and follow-up phases. For Ricky, a mean of 9% of intervals contained AP during baseline. This increased to 21% of intervals during intervention and further increased to 33% during the follow-up phase. Visual analysis of Ricky's graph reveals a stable trend with minimal variability in baseline, an immediate increase upon introduction of the intervention, and a slight positive trend during the intervention phase, except for the final data point, and a moderate-high level of variability. During the follow-up phase there is a slight negative trend with a moderate-high level of variability.

During Tama's baseline phase, a mean of 10% of intervals contained AP. This increased to a mean of 32% during the intervention phase. During the one follow-up session, 25% of intervals contained AP. Visual inspection of Tama's graph reveals a stable trend and moderate variability during baseline and an immediate increase upon introduction of the intervention. There is a slight positive trend and moderate level of variability during the intervention phase.

Anaru's baseline phase had a mean of 5% of intervals containing AP. This increased to a mean of 19% during intervention and further increased to 25% during follow-up. Visual inspection of Anaru's graph shows a fairly stable, slightly decreasing trend in baseline, and an increase from the third intervention data point. During the intervention phase there is a moderate amount of variability and a positive trend. During the follow-up phase there is a continuing positive trend and a moderate level of variability.

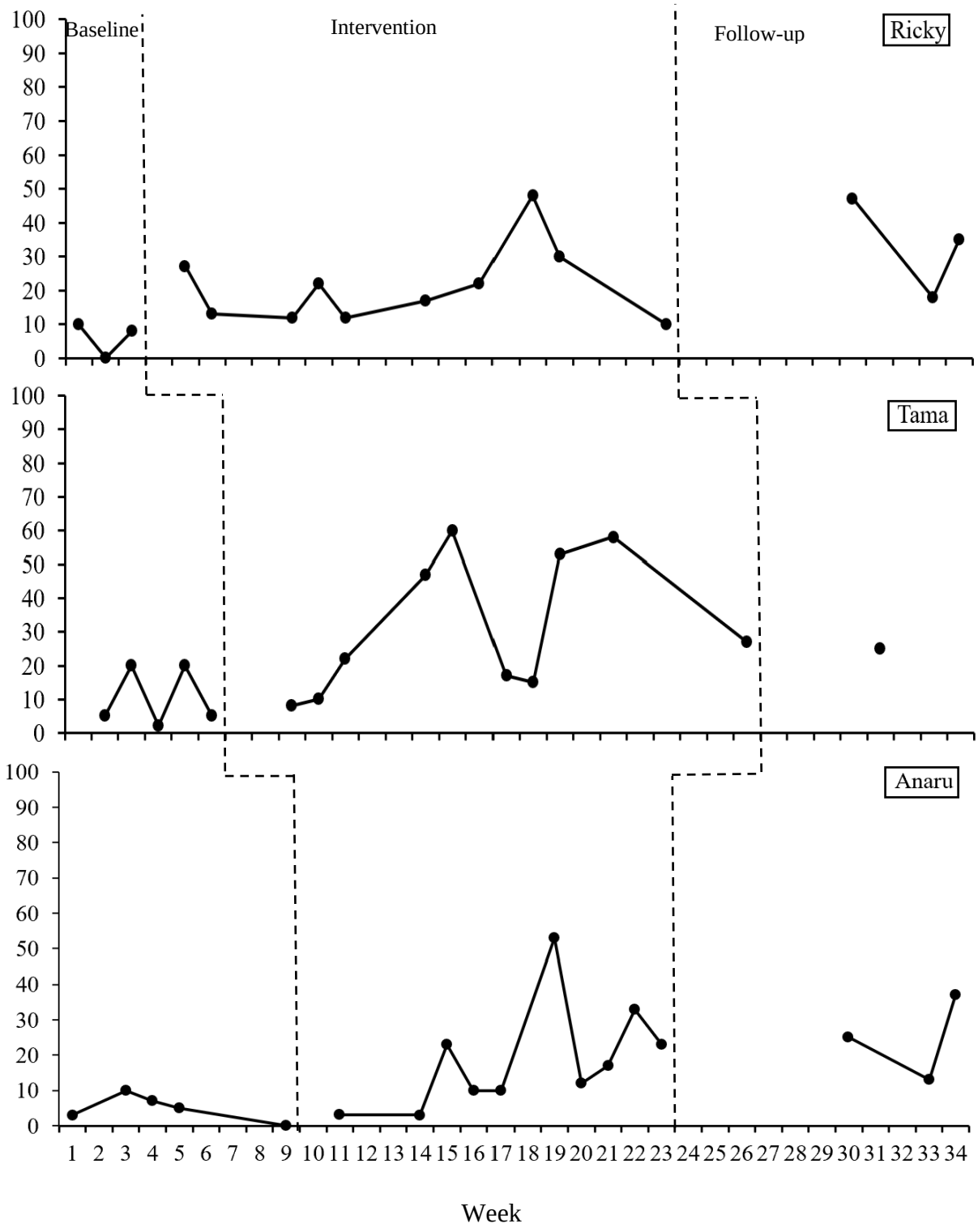

Figure 5.3. Percentage of 10-s intervals containing AP for the whole interval.

Intentional Vocalisations

Figure 5.4 shows the percentage of intervals containing intentional vocalisations (IV) for Ricky, Tama and Anaru across baseline, intervention and follow-up phases. Ricky's baseline had a mean of 1% of intervals containing IV. This increased to 3% during baseline and further increased to 15% during follow-up. Visual analysis of Ricky's graph indicates minimal variability and a slightly decreasing trend during baseline and moderate variability with a slight positive trend towards the end of the intervention phase. During follow-up, there is a slight negative trend and minimal variability.

During Tama's baseline a mean of 9% of intervals contained IV. This increased to 20% during intervention and further increased to 30% during follow-up. Visual analysis of Tama's graph indicates a slightly negative trend with minimal variability during baseline and a gradual increase after introduction of the intervention. During the intervention phase there is moderate variability with a clear positive trend.

For Anaru, a mean of 2% of intervals contained IV during baseline. This increased to 12% during intervention then decreased to 10% during follow-up. Visual analysis of Anaru's graph indicates a stable trend with minimal variability during baseline and an immediate increase upon introduction of the intervention. During the intervention phase there is moderate variability with a slight positive trend and during follow-up, there is no trend and minimal variability.

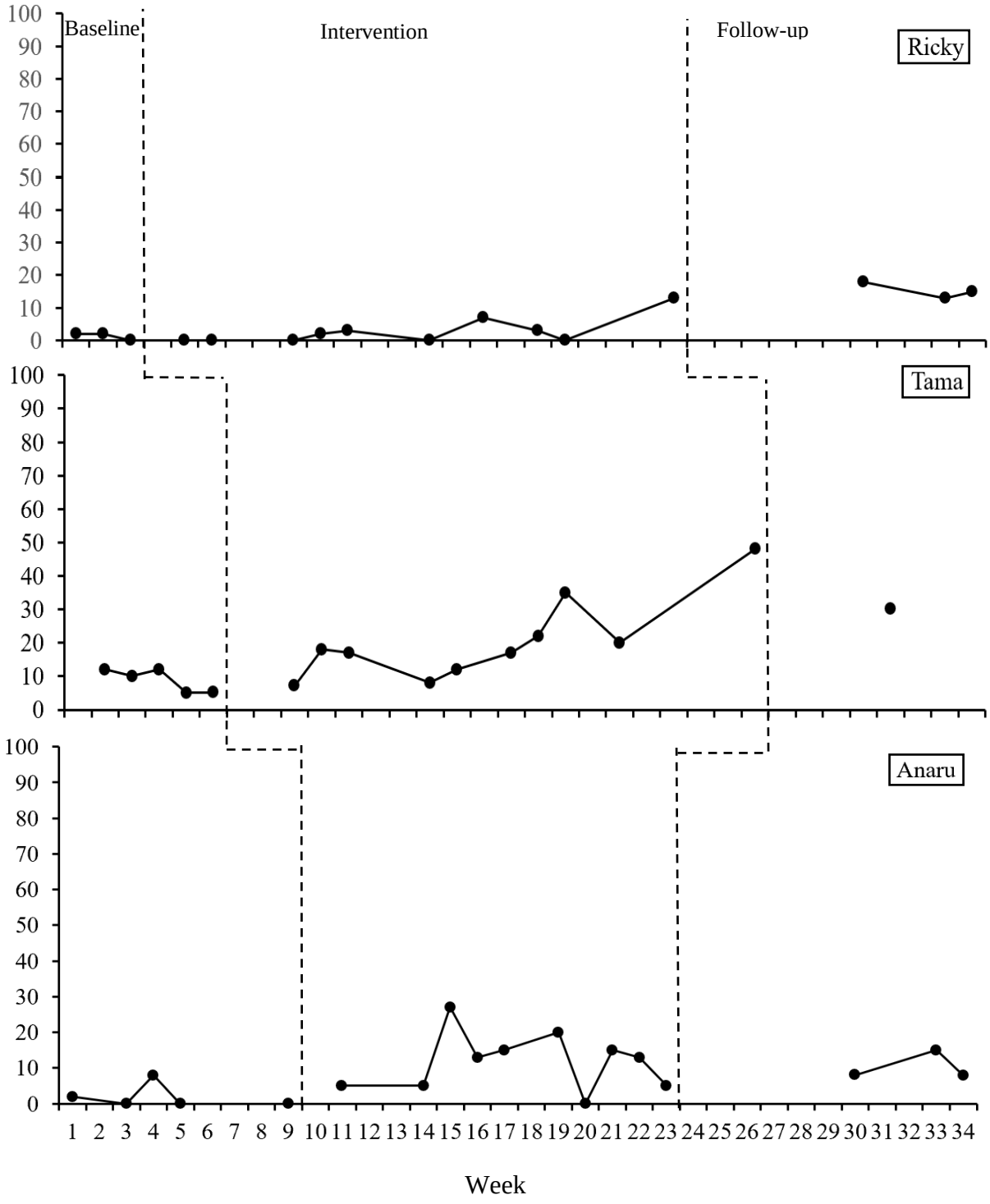

Figure 5.4. Percentage of 10-s intervals containing intentional vocalisations.

Imitation

Figure 5.5 shows the percentage of intervals containing imitation for Ricky, Tama and Anaru across the three phases. During Ricky's baseline phase a mean of 2% of intervals contained imitation. This increased to 5% during the intervention phase and returned to 2% during follow-up. Visual analysis of Ricky's graph indicates a decreasing trend with moderate variability during baseline, an immediate increase upon introduction of the intervention and a stable trend with moderate variability during the intervention phase. During follow-up there is a slightly increasing trend with moderate variability.

For Tama, a mean of 1% of intervals contained imitation during baseline. This increased to 5% during intervention and remained at 5% during follow-up. Visual analysis of Tama's graph indicates a stable trend with minimal variability during baseline and moderate variability with a positive trend during intervention but a decrease on the final data point.

During Anaru's baseline phase, a mean of 2% of intervals contained imitation. This increased to 4% during intervention and decreased to 3% during follow-up. Visual analysis of Anaru's graph reveals moderate variability and a stable trend during baseline. There is an immediate increase, in comparison to the final baseline point, upon introduction of the intervention and moderate variability with a slight positive trend during intervention. During follow-up, there is a slight positive trend and minimal variability.

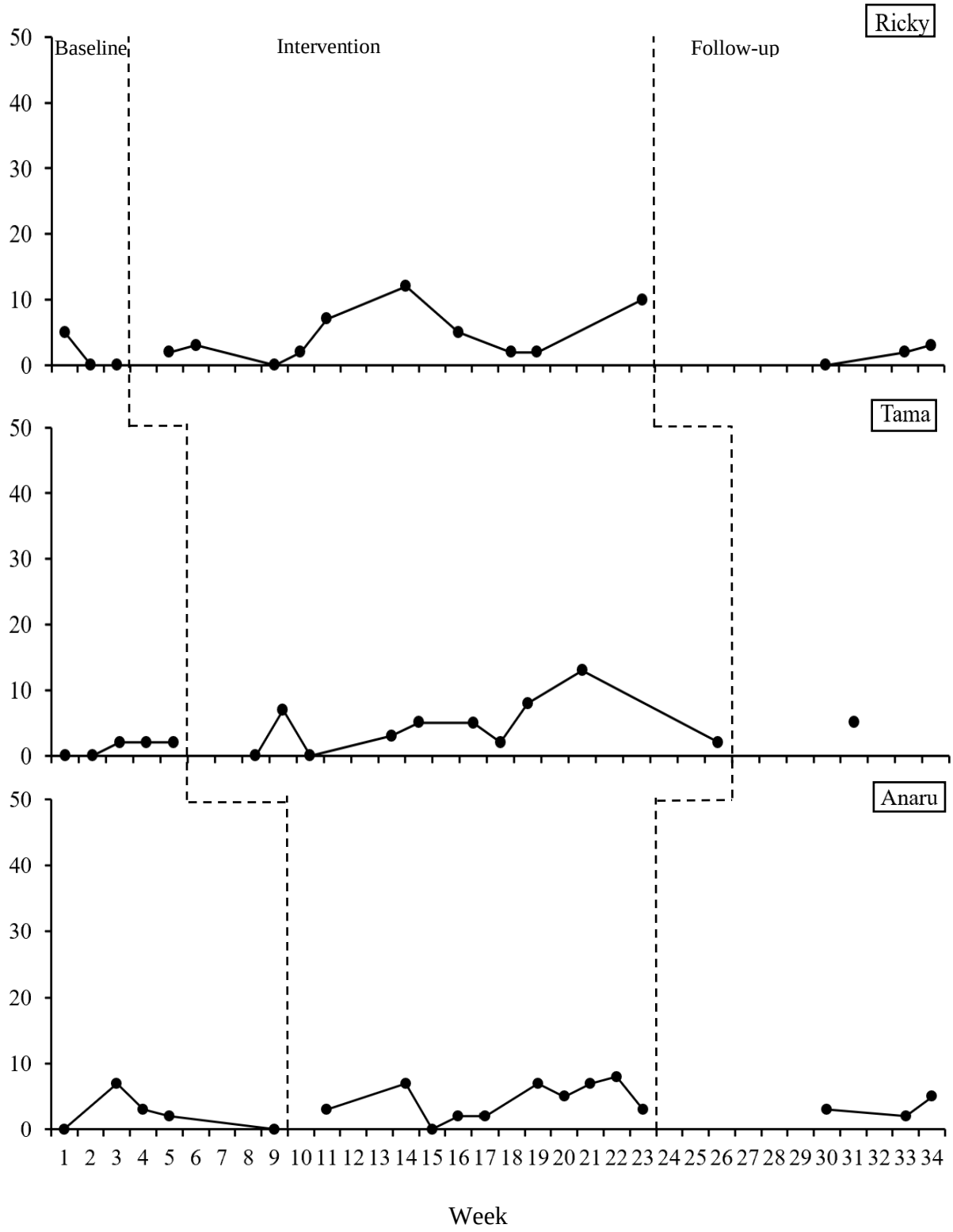

Figure 5.5. Percentage of 10-s intervals containing instances of imitation.

Table 5.6 displays the Tau-U values for AP, IV, and imitation for Ricky, Tama and Anaru. Tau-U values for AP were large/very large for all participants (range = 0.68 – 1.3). This suggests that we can be confident that there was a positive change in AP levels for all participants from baseline to intervention and from baseline to follow-up. Tau-U values for IVs for Tama and Anaru were also very large (range = 0.84 – 1.07), indicating an increase in the level of IVs for both boys as a result of the intervention. Although Ricky's baseline-intervention Tau-U for IVs was only moderate, the baseline-follow-up Tau-U value was very large. The Tau-U for Ricky's imitation from baseline-follow-up was also large, indicating a positive change in Ricky's use of imitation from baseline to intervention. All other Tau-U values were moderate.

Table 5.6

Tau-U scores for Ricky, Tama and Anaru.

	Ricky		Tama		Anaru	
	BL-Int	BL-FU	BL-Int	BL-FU	BL-Int	BL-FU
AP	1.0**	1.11**	0.68*	1.0**	0.76*	1.3**
Imitation	0.57	0.67*	0.44	-0.2	0.48	0.53
IV	0.37	1.0**	0.84**	1.0**	0.87**	1.07**

BL: Baseline; Int: Intervention; FU: Follow-up; AP: Active participation; IV: Intentional Vocalisations; * indicates a large effect size according to Vannest & Ninci (2015); ** indicates a very large effect size according to Vannest & Ninci (2015).

Social Validity

Table 5.7 displays TARF-R and exit survey results for the three teachers, Kelly, Helen, and Bear. Results from the TARF-R indicate that teachers rated the ESDM intervention as highly acceptable (M= 103.7). Helen's ratings for willingness, affordability and side effects were lower than Kelly and Bear's ratings for the same subscales, as a result, Helen's total acceptability score (95) was the lowest of the three teachers. Results from the exit survey indicate improvement in Helen and Kelly's self-rated knowledge, confidence and skill levels in relation to teaching young children with ASD (M = 89%). Bear's rating of her knowledge of teaching children with ASD did not change and her rating of her confidence and skill levels decreased.

Table 5.7

Teacher Exit Survey and TARF-R Results.

	Kelly	Helen	Bear	Maximum Score	Mean
TARF-R scale/subscale					
Understanding	7	6	7	7	6.7
Severity	14	11	9	14	11.3
Total acceptability	103	95	113	119	103.7
Reasonableness	19	19	21	21	19.7
Willingness	19	16	21	21	18.7
Affordability	14	11	14	14	13
Side effects (RC)	17	14	19	21	16.7
Effectiveness	18	18	19	21	18.3
Disruption/time (RC)	16	17	19	21	17.3
Exit survey item	Score (change from entry survey score)				
Confidence	4 (+1)	4 (+2)	3 (-1)	5	3.7 (+0.67)
Knowledge	4 (+2)	4 (+2)	3 (NC)	5	3.7 (+1.3)
Skill	4 (+2)	4 (+2)	3 (-1)	5	3.7 (+0.67)

Note: NC = no change; TARF-R = Treatment acceptability rating form – revised edition (Reimers, Wacker, & Cooper, 1991); RC = reverse-coded

Discussion

The aim of the present study was to evaluate the effectiveness of an 11-week ESDM teacher coaching programme for three teacher-child dyads. For all teachers, use of ESDM strategies improved from baseline to intervention and these improvements were generally maintained at follow-up. A second aim was to evaluate the impact of teachers' participation in the coaching programme on outcomes for the three young children with ASD. The delivery of the intervention was associated with improvements in AP for all children, however only Ricky and Tama showed improvement in IVs. Improvement with respect to imitation was minimal for all children. Where improvements on child outcomes were made during intervention, these were generally maintained at follow-up.

The present results are consistent with Study 1 in which a low-intensity version of ESDM, delivered by a trained therapist, was shown to be feasible for use in similar inclusive

preschool settings and effective in promoting some positive changes in the same child dependent variables targeted in the present study. The present study extends our earlier work by demonstrating the feasibility and effectiveness of co-opting the usual teaching staff as interventionists. This is significant because teacher delivery of EI is likely to be more cost-effective than delivery by outside specialists (Lawton & Kasari, 2012). Minimising the need for outside specialists may also enable community-based organisations to become largely self-sustaining in their delivery of EI and may also help improve access to EI services for families.

Findings from the present study suggest that the coaching programme had some positive effects with respect to improving teachers' use of ESDM strategies with the young children with ASD that they worked with. These results are promising given the relatively low intensity and duration of the coaching programme used in this study. In comparison to the 47 to 138 hours of training delivered over 2 years in the Strain and Bovey (2011) and Young et al. (2016) studies, the teachers in the present study received only 11 hours of training over 14 to 19 weeks. Furthermore, we found improvements in teachers' use of ESDM strategies in preschool environments with an average child-teacher ratio of 10:1, which is significantly higher than the child-teacher ratios reported in most previous studies. We are grateful to an anonymous reviewer for highlighting a potential benefit of the training/coaching programme and that is the possibility of "promoting inclusive preschool programmes by providing training to teachers and increasing their skills and confidence in teaching young children with ASD."

However, it is important to note that when implementing the ESDM, an interventionist is typically only considered to be 'at fidelity' when they are delivering the intervention with a fidelity rate of 80% or higher (Rogers & Dawson, 2010). Due to the use of a modified fidelity scale, it is not possible to make direct comparisons between the fidelity results from this study and recommendations based on the traditional ESDM fidelity rating scale. Also, the exact nature of the relation between fidelity and child outcomes is unclear. For example, a recent study evaluating low-intensity P-ESDM (Rogers et al., 2019) reported that higher levels of parent fidelity were associated with improved child progress on a proximal measure, but not on standardized treatment assessments. Another study, also evaluating low-intensity parent coaching based on the ESDM (Waddington et al., 2019a), reported that increases in parent fidelity did not necessarily translate into greater improvements in child outcomes. *It is possible that interventionists do not need to use all of the ESDM strategies with fidelity in order to improve specific child outcomes. Indeed, the

'active ingredients' of the ESDM have not yet been identified (Baril & Humphreys, 2017). It is therefore interesting to note that throughout the intervention phase, teachers tended to use developmental/relationship-focussed strategies (e.g. using positive affect, modulating child affect and arousal and sensitivity and responsivity) with higher levels of fidelity than behavioural techniques (e.g. instructional techniques and transition between activities). Further research is needed to establish the nature of the relation between fidelity of implementation and child outcomes, particularly regarding teachers' use of individual ESDM strategies. Nonetheless, Bear and Kelly did not reach 80% fidelity during this study and this may have impacted on child outcomes.

Social validity ratings from the present study indicate that teachers viewed the intervention as highly acceptable. This is positive because stakeholder perceptions are recognized as a key factor in the delivery of research-based practices in community settings (Stahmer et al., 2017) and may impact upon the long-term viability of community-based intervention. Indeed, Strain and Bovey (2011) suggested a positive correlation between teachers' ratings of social validity and the extent to which they use an intervention with fidelity. This may indicate that teachers who view an intervention as socially valid are more likely to implement it with higher levels of fidelity. This does not appear to be the case in the present study as Helen provided the lowest social validity rating yet had the highest overall fidelity level. It would seem valuable for future studies to more closely examine the relationship between teacher perceptions of an intervention and the extent to which they use the intervention with fidelity. This information may also be useful for informing the design of future teacher coaching programmes as it may indicate some value in coaching programmes directly addressing the social validity of the intervention for the individual teacher(s) involved.

Results from the teacher exit surveys show improvements in Kelly and Helen's self-rated knowledge, confidence and skill levels in regard to teaching young children with ASD. However, Bear's responses indicate a decrease in confidence and skill levels between entry and exit surveys. Interestingly, Bear's use of ESDM strategies initially decreased upon introduction of the intervention, before steadily increasing during the intervention phase. Together these results may indicate that Bear was initially overwhelmed by the new learning involved in implementing the ESDM and this may have impacted upon her perception of her skill and confidence levels. It would be useful for future research to more closely examine the impact of this specific coaching programme on teachers' sense of confidence in working with young children with ASD.

Teachers' increased use of ESDM strategies in the present study lead to improvements in AP for all children, however improvements in IVs and imitation were less promising. Variability in children's response to intervention is a common feature of ASD research (Stahmer et al., 2011) and due the heterogeneity of ASD, it is likely that no one intervention will be effective for all individuals with ASD (Goldin & Matson, 2017). Further, implementation in an educational context is very complex (Guldberg, 2017), and results for individual children are likely to be influenced by a myriad of factors. This may lead to greater variability in results across individual participants. *It is also possible that behaviourally based strategies play an important role in teaching children to imitate and use IVs. Thus, teachers' relatively low fidelity levels with respect to using some of the behavioural ESDM strategies may have negatively impacted upon child improvements on these outcomes. It is not possible to make direct comparisons with the child outcomes from other inclusive preschool-based studies due to differences in outcomes measured and the methods used to measure them. It is concerning however that none of the children in the present study made significant gains in their use of IVs or imitation and it may be valuable for future studies to explore ways to better address these two variables in an inclusive preschool setting.

Nevertheless, the gains that all children made in AP should be considered promising given the importance of AP to social learning. For this study, AP was essentially a measure of engagement that included interaction with a teacher and/or peer. This type of interactive engagement can be viewed as a vehicle for other learning and is thought to be especially important for learning tacit skills and knowledge such as acceptable social practices, routines and unspoken rules (Williams & Williams, 2001). Further, the social motivation theory of ASD suggests that due to deficits in social attention and social motivation, young children with ASD tend to spend less time paying attention to and interacting with others and may therefore miss out on important social learning opportunities (Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012). Thus, an increase in AP, and therefore an increase in time spent interacting with others, may indicate that participating children were provided with opportunities for learning from others that they may have otherwise missed out on.

Limitations and Suggestions for Future Research

When interpreting the results of the present study, several key limitations should be considered. The study's sample size was limited, and the results may not generalise to other teachers or children with ASD. This study should be replicated with different groups, such as newly qualified teachers or younger children, to test the generality of the current findings.

* The following two sentences were not included in the original published article.

Also, there was no measure of generalisation of teacher use of the ESDM strategies to other young children with ASD because we did not have access to another child with a diagnosis of ASD at each preschool. Given that a key rationale for training teachers to use EI is the potential for intervention to be delivered to multiple children within the preschool environment, consideration of generalisation to non-target children seems important. It may be valuable for future research to evaluate the impact of this coaching programme on teachers' interactions with other children with ASD.

A further limitation relates to our maintenance data, which were collected over a relatively short period (11 weeks). In order to assess the long-term viability of this approach to EI, it may be useful for future studies to include a longer follow-up period. Similarly, we were only able to conduct one follow-up probe for Helen and Tama before Tama transitioned out of kindergarten to primary school. Although participant absence and attrition are common in research conducted in applied educational settings, future research could target younger children who are more likely to be able to participate for the duration of the study.
Finally, although the overall mean IOA rates were above the minimum acceptable level of 80% for all dependent variables, rates for teacher fidelity and child active participation fell below acceptable levels for at least one session for each dyad. This may impact on the internal validity of the present study. Future studies could monitor IOA levels throughout the study and retrain the independent observer if the percentage agreement falls below 80%. Given these limitations, this study should be considered as preliminary.

Conclusion

The results of this study suggest that a modified P-ESDM coaching programme was effective in training preschool teachers to use ESDM strategies with young children with ASD in the preschools where they work. It also appears that teachers' use of these strategies may lead to improvements in AP for the young children with ASD that they teach. However, results for the remaining child outcomes were mixed. There is a clear need for further research to address the limitations of the present study and the questions that it raised.

CHAPTER 6
TEACHER INTERVIEWS

This chapter describes the method and results of the interviews conducted with the teachers who participated in Study 2. The purpose of these interviews was to understand the teachers' perceptions of the intervention. This type of information might indicate the extent to which this intervention was viewed as practical and feasible for implementation in a preschool setting, which in turn might help to inform replication and sustainability in other similar settings (Stahmer, Aranbarri, Drahota, & Rieth, 2017). Also, an examination of participant perspectives may provide researchers with "novel, meaningful and complementary insights" into the impact of an intervention (Knoche, Kuhn, & Eum, 2013, p. 27).

Quantitative measures of social validity, such as the TARF-R (Reimers, Wacker, & Cooper, 1991) — which was used in Study 2 — are widely used to solicit the perceptions of participant stakeholders. However, such measures do not provide researchers with an understanding of the reasoning for informants' ratings (Leko, 2014). It was therefore considered important to further explore teachers' perceptions of the intervention via the use of an interview protocol. The interview protocol designed for the present study was intended to provide a more in-depth, holistic understanding (Leko, 2014) of teachers' perceptions of the intervention than was provided by the quantitative measure, that is the TARF-R.

This chapter provides a description of the interview methodology and presents the results of the interviews conducted. The implications of these findings are also discussed, both in terms of future research and the use of the coaching programme and Early Start Denver Model (ESDM) strategies in community-based preschool settings. For ease of understanding, the term 'coaching programme' will be used to refer to the coaching sessions that the teachers participated in, the term 'ESDM strategies' will be used to refer to the ESDM procedures that the teachers used, and the term 'intervention' will be used to refer to the entire intervention evaluated in Study 2, that is both the implementation of the coaching programme and the teachers' use of ESDM strategies.

The overall purpose of the interviews was to examine teachers' perceptions regarding the acceptability and effectiveness of the intervention. Specifically, the researcher sought answer the following questions:

1. How did the teachers describe their experiences with the intervention?
2. How did teachers describe the impact of the intervention with respect to the children, themselves and others at the kindergartens?

3. What challenges did the teachers experience with regard to the intervention?

Method

Ethical Clearance and Informed Consent

This study received ethical clearance from the New Zealand National Health and Disability Ethics Committee (reference number 18/CEN/29/AM01). Informed consent was obtained from participating teachers.

Participants

Participants were the same three kindergarten teachers who had participated in the ESDM teacher coaching programme in Study 2: Kelly, Bear and Helen. These participants were described in Chapter 5.

Design

A qualitative multiple case study design was used, and each participant was considered to be a single 'case'. The case study design was selected because it allows for flexibility and, according to Simons (2009), allows researchers to gain an in-depth, holistic understanding of the phenomena being studied.

Procedures and Interview Protocol

Data were collected via teacher interviews that were conducted immediately after each teacher's final follow-up session for Study 2. Teachers were interviewed individually at a time and place that suited them. For all teachers, interviews were conducted at the kindergarten where they worked. The interviews followed a semi-structured format. This means that the researcher loosely followed a protocol of questions and probes, but this was not strictly adhered to, and the researcher remained responsive to emerging ideas and topics put forward by the teachers. The researcher emailed the proposed interview protocol to each teacher one week before their scheduled interview to allow teachers the time to read through the questions and to make adjustments (e.g. adding or altering proposed questions). None of the teachers suggested any changes or additions to the proposed interview protocol.

The protocol (see Appendix M) covered the following topics: (a) the ESDM topics presented during coaching sessions, (b) the practical ESDM strategies, (c) the structure and content of the coaching sessions and (d) the perceived effectiveness of the intervention in terms of outcomes for the teacher and participating child, as well as other teachers and children at the kindergarten. Teachers were free to discuss the topics in any order. Prior to the start of the interview, teachers printed out the protocol and jotted down notes in response to each of the questions. The teachers referred to these notes throughout their interview. The teachers were not asked to print out the protocol or make written notes but did so of their own

accord. Interviews were audio recorded using an Apple® iPhone and were later transcribed verbatim and then summarised (see **Data Analysis**). Pseudonyms were used and all transcription records were kept confidential. Prior to data analysis, teachers were provided with a summary of their interview transcript via email and asked to check that the researcher had accurately captured their ideas and contributions. All three teachers confirmed that their ideas had been accurately captured.

Data Analysis

Reflexive thematic analysis was used to analyse interview data following the process described by Braun and Clarke (2019) and Clarke, Braun, Terry and Hayfield (2019). Specifically, during the first stage of analysis, the researcher read and re-read the interview transcripts to familiarise herself with the data and to develop an understanding of its possible overall meaning. Notes were made during this stage to capture elements common to the different teachers and to note connections in the data, such as common words and phrases used across participants or contrasting descriptions of different phenomena. Next, codes were generated in line with the research questions. Specifically, data were organised into chunks of text that appeared to have a shared meaning (e. g., all responses that included reference to child-teacher ratios were grouped together) and each chunk was assigned a label (code, such as “ratios”).

A deductive approach to coding was used where the researcher started with ideas and concepts based on findings from a recent qualitative study examining parent perceptions of an ESDM-based parent coaching programme (Waddington, van der Meer, Sigafoos, & Bowden, 2020a) and some general early childhood education (ECE) teacher coaching studies (e.g. Artman-Meeker et al., 2015; Elek & Page, 2019; Knoche et al., 2013; McLeod et al., 2018kasi; Twigg et al., 2013; Wilson et al., 2012). Some codes were also constructed inductively during the coding process. Because the aim was to provide a descriptive account of teacher’s experiences and perceptions, semantic codes were used. This means that the coding occurred at the surface level and focused on the explicit content of the data rather than on underlying or implicit ideas (Clarke et al., 2019). In the next step of analysis, tentative themes were constructed by organising codes into clusters of meaning. For example, all of the codes that related to complications associated with using the intervention in a preschool environment were organised together (see Appendix N for a table containing examples of the codes used for this theme). Themes were then refined and defined and finally checked against the entire dataset to ensure that they accurately reflected the data. At this stage, the researcher used peer debriefing (Guba, 1981) to check the credibility of these themes with a colleague

who was also conducting research into professional development for ECE teachers. In line with Braun and Clarke's (2019) recommendations on TA procedures, no inter-coder agreement checks were conducted. Braun and Clarke (2019) assert that such checks are unnecessary in thematic analysis because under this approach coding is subjective and shaped by the researcher's own personal knowledge and understanding. Thus, there is "no one 'accurate' way to code data" (p.14).

Results

Eight major themes were constructed from the data, these were: (a) the importance of time and practice, (b) the relation between knowledge, understanding, frustration and patience, (c) the relationship between teacher and coach, (d) understanding and using the different strategies, (e) child outcomes were the most important indicator of intervention success (f) the impact of the intervention was wider than just one teacher and one child, (g) child relationships and sense of belonging, and (h) Complications associated with using the intervention in a preschool environment. Research questions and the themes that correspond to them are delineated in Table 6.1.

Table 6.1

Research Questions and Corresponding Themes

Research Question	Themes and sub-themes
How did the teachers describe their experiences with the intervention?	The importance of time and practice. The relation between knowledge, understanding, frustration, and patience. The relationship between teacher and coach. Understanding and using the different strategies.
How did teachers describe the impact of the intervention with respect to the children, themselves and others at the kindergartens?	Child outcomes were the most important indicator of intervention success. The impact of the intervention was wider than just one teacher and one child. Child relationships and sense of belonging. The child-teacher relationship. Relationships with others and sense of belonging.

What challenges did the teachers experience with regard to the intervention?	Complications associated with using the intervention in a preschool environment.

Research Question 1: How did the teachers describe their experiences with the intervention? The themes related to this research question are: (a) the importance of time and practice, (b) the relation between knowledge, understanding, frustration, and patience, (c) the relationship between teacher and coach, and (d) understanding and using the strategies. These are presented below.

The importance of time and practice. Time was an important influence on teachers' experience of the coaching programme. This was highlighted by Kelly who, due to an administrative error, did not receive the 1-hour per week of release time that the other teachers received for the coaching. Kelly spoke about the pressure of 'juggling too much" and being unable to complete the weekly self-review checklists due to time constraints. She also described the feeling of failure she experienced as a result.

> I thought it was good being able to set a goal for something to work on, but to be honest with you I didn't ever really get time to go through and evaluate myself. There was just never time to be able to do that… I think that was probably the only thing I found not helpful because I kind of felt like I'd failed a bit in not being able to get them filled in.

Kelly went on to suggest that "if I had that release time, I think it would have been fine". However, Helen, who did receive release time, also described time constraints as a barrier to her engagement with the coaching programme.

All teachers indicated that they would have liked more time to learn and practice using the ESDM strategies. Bear suggested that it would have been better to have more than one coaching session per week while Helen indicated that it would have been useful to have "a longer period of time" between each of the topics. Time was also described as a barrier to using the ESDM strategies with the children and all teachers indicated a desire for more time to work one-on-one with participating children.

Teachers found that the hands-on practice portion of the coaching programme was the most valuable, as typified by the following quote:

> That was a real key for me around my own learning it was actually just implementing it at the time and you giving me that kind of, that verbal support as I went through and

> modelling or suggesting "actually give it a try this way or..." That was really, the hands-on approach was just the best way for me, really valuable. (Kelly)

Bear explained that hands-on practice helped to solidify her understanding of the written coaching materials and that without the practical component, the coaching would be "just words on paper and stuff in your head." All teachers indicated that more hands-on practice time would have been beneficial. Bear and Kelly also commented on how they found the coach's modelling of new strategies during practice sessions useful:

> What I loved most is when you were working with Anaru and I could see oh man, you know, you've got the experience you know how to get their attention and how to hold it and make it exciting. It's like there's so much to learn, but it's good. (Bear).

Helen suggested that completing the training alongside other teachers from the same kindergarten would have provided more opportunity for practice and feedback from others who would be "on the same page" with their understanding of ESDM. Teachers also indicated that it would have been useful to have their own copies of the video observations (taken during the research project) to reflect on in their own time, rather than just during the coaching sessions.

Time was also important to the children's learning, the teachers used phrases such as "over time," "little by little" and "slow" when describing the children's learning. The significance of time in relation to children's development and readiness to learn was also described. For example, Kelly found that it was important to revisit strategies with Ricky because strategies that were "not successful" during the early stages of the intervention were later successful. Kelly suggested that this was because the early strategies (e.g. gaining attention, building a fun, responsive relationship and learning to take turns) "supported other learning" and helped Ricky to "learn to learn" but that she and Ricky required time and practice to master these early strategies.

Practice was also important for children's learning during the intervention. Teachers commented on the progress that they observed in children as a result of regular practice. They also indicated that children did not make progress in skills that were not practiced as often. For example, Bear explained that Anaru did not show progress in learning to 'high-5.' She suggested that progress was slow because "it's something that we have to actually practice lots." Practice was also described as important to the maintenance of improvements in child behaviour/skills:

> There wasn't anywhere where we saw no improvement really, apart from when he was away and just the fact that we couldn't consistently keep doing it. That was

probably where we saw a regression, as I said before. But that's the thing, it made me realise that it's not one of those things you can just do once or a few times and then put it in a box for two months and then come back to it and expect them to be right where they were. (Helen)

The relation between knowledge, understanding and frustration. The teachers described their own learning process during the coaching programme as gradual. Bear described the process as a "journey" that needed to be taken slowly, "step by step". Kelly spoke about her learning during the intervention as "building up a picture" of how to support Ricky. Teachers suggested that while it was relatively simple to learn the content of the coaching programme, time was needed to perfect and fine-tune their use of the ESDM strategies. Helen suggested that this may be especially true for teachers who had more years of teaching experience because they would have to "think about, reflect and change their practice quite considerably." She went on to explain that the coaching had provided her with a "new way of thinking" as many of the strategies were things that she would have "never in a million years thought of doing." The teachers talked about storing the new knowledge that they gained in their "teaching kete[5]" alongside their existing professional knowledge. Helen explained that the new knowledge "doesn't undo what you've learnt in your (teacher) training," instead it "adds to your repertoire."

The intervention was also associated with an increase in understanding for teachers. Teachers discussed improvements in three different areas of understanding: a) their understanding of ASD, b) their understanding of the ESDM strategies and c) their understanding of the child they were working with. For example, Kelly reflected on improvements in her understanding of challenges that are commonly faced by children with ASD. She went on to say that this has helped her to recognise when she might need to make a referral for an ASD assessment for children at the kindergarten. Teachers also spoke about their increased understanding of the ESDM strategies and the impact that this had on their teaching practice:

> I understand more and I'm more confident working with children with ASD. So yeah, I just find that if I see something happening, I know how to respond more confidently. (Bear)

Teachers also described the impact of the intervention on their understanding of the target children. For example, Helen reflected on how she "got better at reading Tama's cues" and Bear shared how she felt more "attuned" to Anaru's "moods and behaviours" and understood how to "recognise the signs of over-stimulation and under-stimulation" and "know the times when he's ready to move on to a new activity."

[5] Kete is the Māori word for bag or basket.

There was a clear relation between understanding and frustration for the teachers. Bear described the feelings of frustration that she felt due to a lack of understanding before the intervention and how she became more patient with Anaru once she could "understand more about strategies to use with him" and could "patiently use them without wondering what's going on." Similarly, Kelly described an increase in her tolerance when working with Ricky:

> I think I've got more tolerance because I kind of understand it more and I understand ways to support him more instead of feeling that overwhelming frustration and overwhelming sense of "what do I do? I do not know how to support you".

The relationship between teacher and coach. Teachers indicated that their experience with the coaching programme was influenced by their relationship with the coach. Bear described how she felt supported and confident in the process because she knew that "if I did get stuck on something, I knew you (the coach) could help me with it." Kelly shared how having an open and honest relationship helped her to build confidence:

> We could just kind of freely and honestly talk and nothing was ever not ok, you know. I could say "hey I really struggled with it this week" and you know, you (the coach) were good with that.

Teachers also expressed the importance of having a coach who was "willing to be flexible" and work around the demands of a busy kindergarten. Helen commented that the flexibility of the coach was "really beneficial because you know in this environment it's really difficult, you're not going to go very far if you've got a very rigid timetable and everything is really prescribed."

Understanding and using the different strategies. Teachers reported finding all of the strategies useful but described some strategies as feeling "more natural" to use than others. Interestingly, the techniques that teachers reported as natural or easy to use were also the ones that they described as useful or effective. For example, teachers found it felt natural to add pauses to songs and people games to encourage communication. They also found this strategy to be one of the most effective:

> When he was on the swing and then I'd push him and then I'd either grab on hold of the swing or grab his legs and then stop and you know and like all communication would stop, all movement would stop and he'd give either eye contact or a sound to indicate "hey I want some more of this, you know, I'm really enjoying this," that worked really well. (Kelly)

Other strategies that teachers described as “fitting naturally” into their teaching practice included positioning themselves face-to-face with the child, providing choices, holding objects up near their faces and observing and responding to the child’s cues and communicative attempts. Kelly also found that imitating Ricky came “pretty naturally” and this was also one of the strategies that she found to be “really useful”.

Other strategies did not seem to fit naturally into the teachers’ existing teaching practice. Teachers all described the behavioural teaching techniques (e.g. using clear cues, prompting to elicit behaviour, and etc.) as “challenging.” Bear explained that for her, the techniques were “something I have to think about quite hard” and “I would have to really work on to get more right and to get into my head.” She suggested that it would have been helpful to have a simplified handout with “lots of practical examples” to explain the strategies because she found the handout that was used in the coaching programme “really hard to follow.” Kelly found it easy to understand the behavioural teaching techniques but found it challenging to use them:

> You're trying to think of a, b, c, d and e, and then I kind of like, I would be “damn I forgot C “or you know. It just got a bit meaty and it was a hell of a lot to remember.

Kelly also commented that she did not get the same level of success with the behavioural techniques as she was able to achieve when using the more natural techniques. She referred specifically to the techniques for dealing with unwanted behaviour, explaining that she felt that “trying to use some of those strategies to redirect him, they may work one day but then they don't work the next time.” She felt the techniques were still useful, as she had success using them with other children, but indicated that it would have been valuable to have some alternative strategies to use with Ricky. Helen also found the techniques for dealing with challenging behaviour difficult to use:

> You'd see something unfolding before your eyes and by the time he (Tama) had you know hit out at a child or broken something, you had like a second and so it was too late by then, kind of the moment had happened to the child and the child was upset. And you know you can do the prompt after, but it kind of almost didn't feel relevant to do it after after-the-fact.

In terms of the planning and resources required for teachers to use the ESDM strategies, Kelly explained that “you would need to think about what you were going to do beforehand and you know think about which strategies you’d use and which resources you’d need.” Bear explained that the level of planning required was “not really an extra” but just what they did “for all the children.” Teachers did not feel that any extra resources were

required, beyond what was already available in the kindergarten. However, Helen felt that "it would've been cool" to have extra resources to support Tama's "learning interests." Bear also purchased bubbles, balloons and balls to use with Anaru in the early stages of the intervention.

Research Question 2: How did teachers describe the impact of the intervention with respect to the children, themselves and others at the kindergartens?

The themes related to this research question are: (a) child outcomes were the most important indicator of intervention success, (b) the impact of the intervention was wider than just one teacher and one child and (c) child relationships and sense of belonging.

Child outcomes were the most important indicator of intervention success. Teachers viewed child outcomes as a key indicator of the success of the intervention. When speaking about child progress they consistently used phrases such as "it's so cool," "I'm amazed" and "it's very exciting." Teachers also commented on child outcomes in relation to their goals for the child at the beginning of the intervention. For all teachers, these goals centred around the child's participation in the kindergarten programme and their relationships with others. All of the teachers indicated that they felt the intervention had been successful in supporting them to achieve these goals:

> What I wanted to achieve out of it (the intervention) was to be able to support him (Tama) to you know, be immersed more in the programme and to develop interactions with kind of the wider kindergarten, not just specific teachers. And that happened so we kind of met the goal of what I was hoping I was going to get out of it. (Helen)

Teachers also described improvements in the children's communication as a result of the intervention. Bear described how Anaru's receptive communication improved during the intervention, commenting on how he now "turns around to look at you" when his name is called. Helen observed an improvement in Tama's verbal communication, noting that after the intervention Tama became "really good at telling you when he didn't like something." She also commented on how Tama learned to participate in "back and forth" communication with her during the intervention. Kelly indicated that Ricky's ability to follow simple instructions and non-verbal communication skills had improved as a result of the intervention. She also commented that by the end of the intervention, Ricky had begun to "make speech sounds" and "say some words."

Bear and Kelly also viewed the intervention as successful in addressing specific unwanted behaviours in the children they were teaching. Bear described how, prior to the intervention, Anaru would take food from other children's lunchboxes and would frequently

remove his trousers and then refuse to put them back on, even in very cold weather. She also described how this behaviour had improved during the intervention and commented that "he's gone from that (the unwanted behaviour) to having several activities which he enjoys." According to Kelly, prior to the intervention, Ricky spent a lot of time at kindergarten climbing on furniture or running around the inside of the kindergarten, tipping toys off shelves. She described how Ricky's development of positive behaviours during the intervention contributed to a reduction in these unwanted behaviours:

> We saw a huge positive change in his behaviour once he could start to communicate and we actually kind of understood what he was trying to communicate. His behaviours have really decreased, like major. Like we maybe have 10% issues with behaviour now compared to 80 to 90% before.

Teachers also observed behaviours/skills where children showed minimal/no improvement. Bear commented on how Anaru had not showed any progress in pretend play skills and had not learned to share a 'high-5' with a teacher or peer. She also noted that his progress in imitation had been only minimal. Helen explained that Tama's progress with combining vocalisations with gestures had been only minimal and suggested that it would require "a lot more time and practice" for Tama to "really get it." Kelly talked about challenges in getting Ricky to participate in activities that did not involve his favourite alphabet blocks. However, she noted that she had observed some progress in this towards the end of the intervention.

Helen also observed that the intervention had a minor negative impact on Tama during the early stages when she was still learning to read Tama's cues and respond to them sensitively:

> I suppose when he (Tama) wasn't in the mood it could kind of, I mean I got better at reading his cues over time and coming back to just sitting or just being next to him and stuff, but you know really momentarily little bits of kind of anxiety and stress because someone was kind of getting in his space.

However, she explained that she only observed this during the early stages of the intervention when she was "still learning what to do."

The impact of the intervention was wider than just one teacher and one child. Helen, Kelly and Bear were the only teachers from each of their kindergartens to participate in the coaching programme. However, they all indicated that they shared the ESDM strategies and coaching materials with the other members of their teaching teams. Helen shared information with her teaching team regarding how to match an adult's use of language

to a child's needs. She felt this had been beneficial for the rest of her team but suggested that she would have liked others from her kindergarten to have trained alongside her so that they would be "on the same page with their understanding." Each week Kelly ran a session with the teaching team from her kindergarten to pass on information from that week's coaching session. She reported that all of the teaching team were now using the strategies in their interactions with Ricky. Bear also shared the strategies and coaching materials with the teachers from her kindergarten. She described how Adam, a teacher from her kindergarten, had been able to successfully use the ESDM strategies in his interactions with Anaru:

> Adam has been using those (ESDM) strategies to engage him, he had been doing the whole swing, you know waiting and the reward, and so that was when they started to build that relationship. And it was also the chasing around, the going around outside, and he was chasing him and rewarding him by picking him up and putting him on his shoulders.

On the other hand, Helen reported that her use of the intervention put extra pressure on the other teachers at her kindergarten. She explained that at times "another teacher would have to cover the whole floor because I was trying to work one-on-one with Tama." Similarly, Kelly explained that the teaching team at her kindergarten faced "extra pressure" due to her participation in the coaching programme.

The teachers reported that they were also able to use the ESDM strategies with other children, with and without ASD, at their kindergartens. Kelly commented that with children who were at-risk or waiting for a diagnosis of ASD, she and the other teachers now had the knowledge and confidence to "just start implementing these strategies." Bear indicated that she was finding the strategies useful for all children at the kindergarten, including those with ASD. Helen commented that her teaching team found the strategies were also useful with children with "developmental or sensory difficulties".

Child relationships and sense of belonging. This theme covers the importance of relationships and the impact of the intervention on different relationships. It is made up of two sub-themes: a) the relationship between the teacher and the child, and b) relationships with others and sense of belonging.

The relationship between the teacher and the child. When asked what the most rewarding part of the intervention was, Helen replied:

> I think it was just you know having those really nice interactions where you could tell he was really engaged and just the like the smiles and the laughter and you know

> you'd start something with him and he would carry it on, that was him interacting with you rather than you trying to force yourself on him.

This sentiment was also reflected in comments from Kelly and Bear. Kelly suggested that before the intervention Ricky "probably saw me as the grumpy teacher" but now "I've become the fun teacher." She also described how building predictable activity routines with Ricky had led to a more reciprocal, interactive relationship between herself and Ricky, commenting that "he (Ricky) really is engaged in what's happening between the two of us." Bear shared how she had become Anaru's "go-to" teacher and that other teachers often sought her out when Anaru became distressed. She also discussed the challenges that this brought, such as being called to help Anaru during her allocated time in the office.

Relationships with others and sense of belonging. Teachers also reported that the children developed stronger relationships with other teachers and peers as a result of the intervention. Kelly shared that:

> He (Ricky) is huge on relationships now. So Kim, the teacher support, she arrived late one day and he obviously noticed her coming in the gate he just ran up to her and gave her the biggest hug. But he's doing that, he's hugging staff members whereas before there was very little body contact… those relationships have actually become really strong.

Bear noticed Anaru "seeking out other people to be with" and "watching what the other children are doing." She also spoke about the relationships that Anaru had developed with other teachers, especially Adam (discussed in more detail on p.16). Helen also noticed positive changes in Tama's relationships with other teachers and peers.

Strongly linked to the idea of relationships was the concept of belonging. Bear spoke of how Anaru had become "part of the whole gang" at kindergarten. She also shared stories of how Anaru now joins in with whole-kindergarten activities such as sitting at the table for kai (food), joining mat time and helping to tidy up at the end of the day. Kelly talked about how Ricky was beginning to notice the teachers and seemed to "really know which one is which now." She also shared that he had started to participate in a wider range of activities at the kindergarten. Helen commented:

> Towards the end (of the intervention) he (Tama) was starting to show naturally that he wanted to be part of what others were doing and that was really amazing to see because there had never been anything like that before.

She went on to explain that this was challenging to begin with because some of the children "were a bit nervous of him (Tama) coming because you know the only other interaction they

had ever had with him was when he whacked them because they were in his space." However, once they saw that "he was actually trying to do what they were doing" they "were fine."

Research Question 3: What challenges did the teachers experience with regard to the intervention?

Complications associated with using the intervention in a preschool environment. Another theme that was evident in teachers' interview responses related to complications associated with using the intervention in a busy preschool environment. For example, Kelly described challenges associated with the physical layout and free-play nature of the kindergarten. Specifically, she described how there were always a lot of activities out and available so when she offered Ricky choices of activities that did not involve the alphabet, he would "just kind of zone out and head off for something he wanted to do." This made it difficult to support Ricky in participating in a range of different activities.

Helen noted that the high teacher-child ratio made it difficult for her to have the opportunity to work one-on-one with Tama, she suggested that a ratio of 1-5 would be ideal for implementing the intervention. She went on to explain that because of the high ratios, her interactions with Tama were often "in the moment," so she did not usually have the opportunity to mentally plan and prepare for them. Also, as discussed in the 'learning and using different strategies' theme, Helen found it hard to "get to Tama in time" to prompt for replacement behaviours. She explained that this was especially challenging on days when there were "40 kids and everybody's inside because it's raining." The teachers also talked about the challenge of having to deal with the needs of multiple children at once together with other teaching-related tasks. Helen commented that "other things going on at the kindergarten sometimes superseded" their use of the ESDM strategies.

Helen and Bear also indicated that having many "children with diverse needs" at their kindergartens made it challenging for them to spend time using the intervention. Teachers also talked about the challenge they faced when other children wanted to join in with the intervention but the child they were working with didn't want them to:

> Quite often there were children really interested in what was happening and you know sometimes it would work but then others that maybe wanted to get right in there when he (Tama) didn't want to have a bar of it, that would prove kind of challenging because it kind of stopped what you were doing. (Helen)

Helen suggested that "in an ideal world" she would like to have access to a space where "you can shut the door and there's resources in there that the child can explore one on one with

you." She suggested that it would be valuable to spend some time each day using the ESDM strategies with the child in this sort of space, then spending the rest of the day in the normal kindergarten environment.

All three teachers emphasised the importance of having other team members "onboard" as well as the importance of clear communication between teachers. Kelly described how teachers at her kindergarten found that when working with Ricky they needed "to swap out every couple of hours" because using the ESDM strategies can be "exhausting" and teachers "mentally need a break." She also described how teachers would give one another a "run-down" when swapping to work with Ricky. The teachers also explained that at times their participation in the intervention placed extra pressure on the other teachers that they worked with. For example, Helen stated that:

> The other teacher within would have to cover the whole floor because I was trying to work one-on-one with Tama, and if I didn't have someone covering me you know when I was trying to do something, or he was really engaged in something and it was a routine time, it just threw everybody out.

Kelly explained how at times this led to feelings of anxiety for her because she felt "such a strong sense of responsibility" to the other teachers in her team.

Discussion

The results presented above suggest that, overall, the three teachers found the intervention to be both acceptable and effective. The teachers expressed enthusiasm and made comments suggesting that they were generally positive about the intervention. They also reported that a number of the ESDM strategies fit naturally into their usual teaching practice and they said that they were able to use them regularly, without the need for a significant level of extra planning or resource. These teachers also perceived the intervention to have had a positive impact on their own knowledge and confidence and a positive impact on the children's communication, engagement and relationships with others. On the other hand, teachers reported challenges related to learning and/or using the behavioural teaching strategies and using the intervention in a busy preschool environment. A number of suggestions were offered by the teachers to address these challenges in future coaching programmes.

Typically, a primary aim of coaching programmes is to effect change in the attitudes and/or practices of the individuals who are being coached (Knoche, Kuhn, & Eum, 2013). It would therefore seem promising that teachers in the present study reported increased knowledge, understanding, and confidence as a result of their participation in the

intervention. These teachers reported that they had gained new knowledge, which they consolidated with their existing knowledge of teaching and learning. They also reported an increased sense of understanding and confidence, which they said had helped them to be more patient with the target children. It is also positive that teachers reported using the knowledge gained from the coaching programme with other children in the kindergarten. This suggests that teachers may have, to some extent, generalised their learning from the coaching programme, leading to potential benefits for children not directly involved in the intervention. Likewise, teachers reported sharing knowledge gained from the coaching sessions with their team members, potentially benefiting teachers who were not directly involved with the intervention. It may be valuable for future research to directly and objectively measure the generalisation of teacher knowledge and skill to other children and/or teachers.

The teachers also said in the interviews that they found all of the ESDM strategies to be acceptable and effective, but to varying degrees. Some strategies, such as using pauses to elicit communication, encouraging eye contact and imitating the child's actions, were described as a more natural fit in the kindergarten environment. These more natural strategies were also perceived by teachers to be the most effective. In the study by Waddington et al. (2020a), several parents who had received ESDM coaching in the home setting also reported that the use of pausing was helpful to their child's learning. These parents also found elaboration and focussing on communication to be among the more useful strategies. Teachers from the present study did not specifically mention either of these latter strategies when they were asked which of the ESDM strategies they found to be the most effective and/or useful. The differences between the teacher reports on strategy usefulness/effectiveness in the present study compared to that of Waddington et al. could stem from the type of participant (teachers versus parents) and settings (kindergarten versus home). It is possible that some strategies are better suited for use in the kindergarten setting while others are better suited for use in the home environment. This may be a valuable question for future research to address. Research focussed on when and how parents and teachers use each of the specific strategies in their day-to-day interactions with the children may be a useful starting point for addressing this question. It is also possible that individual coaches present and coach strategies differently and this may have an impact on the perceptions of those being coached. It may be useful to conduct future research to directly examine the impact of the individual coach on teachers' perceptions of different strategies.

Behavioural teaching strategies were described by the teachers interviewed in the present research as difficult to understand and/or challenging to use. Teachers suggested that this was because there were a lot of elements involved in using the techniques correctly (i.e. providing clear cues, prompting and providing reinforcement) and it felt difficult to think about them and use them at the same time. One of the ECE teachers interviewed by Knoche et al. (2013) also reported that it was challenging to remember to use several different intervention techniques at the same time. Teachers also reported that they found some of the behavioural techniques challenging to use in a busy kindergarten environment, particularly the use of prompting and techniques for dealing with challenging behaviour, such as teaching and reinforcing replacement behaviours. Twigg et al. (2013) also found that the distractions present in the ECE environment made it challenging for the educators in their study to implement some of the techniques that they had learnt in their coaching sessions. Future research could examine whether teachers' experience with these techniques is more favourable when they receive extra coaching support focussed on these techniques. This research could involve using a coaching programme that includes extra sessions focussed specifically on techniques for using behavioural teaching techniques and managing unwanted behaviour.

Teachers rated all elements of the coaching programme as useful, but reported that hands-on practice, including live coaching, feedback and modelling, was the most useful element. This is consistent with findings from Knoche et al. (2013) who reported that ECE teachers and parents who had received coaching viewed the practical elements of their coaching sessions as useful in preparing them to apply the strategies to their everyday practice. Similarly, Elek and Page (2019) found that 30% of the 53 studies included in their review of the quantitative ECE teacher coaching literature described the practical elements of coaching as important to the success of the coaching programme.

Teachers in the present study also felt that their relationship with the coach was an important element of the coaching programme and described the relationship as open, honest, supportive and flexible. Other studies (e.g. Knoche et al., 2013; Waddington et al., 2020a) have also described the coach-coachee relationship as a key element of the overall coaching programme. It would be useful for future research to examine the specific coaching practices that contribute to teachers' positive perceptions of the coaching relationship. This sort of research could inform the design of future coaching programmes and may also be valuable in training future coaches.

The results from the present research also suggest that teachers wanted more coaching time and more time to practice new skills. Specifically, the three teachers in the present study suggested that they would have liked more than one coaching session per week and/or more time to practice between each session. This is consistent with findings from previous studies (e.g. Knoche et al., 2013; Waddington et al., 2020a), where individuals who were interviewed after receiving coaching also indicated a desire for more coaching time. Despite indicating a desire for more coaching and practice time, teachers from the present research also described the pressure they felt in trying to find time to engage with the coaching programme. They highlighted the importance of adequate release-time to allow them to fully engage with the coaching programme. Again, this appears to be consistent with previous research on ECE teacher coaching (e.g. Twigg et al., 2013) which noted that coaching is often an addition to teachers' already busy workloads.

Teachers from the present research also wanted more time to spend using the intervention one-on-one with the target children. Teachers described this one-on-one time as important to the progress and maintenance of new learning for the target children but found that time was a major barrier to them being able to do so. They explained that demands from the kindergarten environment, such as high child-teacher ratios and the needs of multiple other children with diverse learning needs often interfered with their use of the intervention. The teachers suggested that lower teacher-child ratios would enable them to use the ESDM strategies more often, leading to better results for the target children. Other researchers have also reported that demands from the ECE environment may impact upon teachers' use of skills that they have learnt through coaching (Knoche et al., 2013; Twigg et al., 2013). It may be valuable for future research to explore the relationship between child-teacher ratios and the effectiveness of teacher coaching programmes.

Teachers said that child outcomes were the most important indicator of the success of the intervention. They reported that the children showed improvements across a range of different outcomes. The most noticeable and consistent (across participants) improvements appeared to be in the areas of communication and relationships. This is significant because difficulty in social communication is one of the core deficits of ASD (APA, 2013), so it is promising that teachers perceived improvement in target children in this area of development. Further, one of the key arguments for the inclusion of children with ASD in typical preschool settings is the opportunity to play with and learn from typically developing peers (Koegel, Koegel, Frea & Fredeen, 2001; Vivanti, Duncan, Dawson & Rogers, 2017). However, research suggests that some children with ASD may not benefit from these opportunities as

they are less likely to initiate interactions with peers or respond appropriately to their peer's initiations (Gunning, Breathnach, Holloway, Mctiernan, & Malone, 2019; Pierce & Schreibman, 1997). Indeed, prior to the intervention, teachers from this research described the target children as being "in their own world" and rarely interacting with others. It is therefore promising that teachers noted an improvement in participating children's interactions and relationships with their peers as it may indicate that the target children also received more opportunities to learn from their peers.

Teachers also felt that their relationships with the target children improved through their participation in the intervention. Prior to the intervention, teachers reported feeling frustrated because they did not know how to support children with ASD. One teacher shared that, before taking part in the intervention, she was probably viewed as "the grumpy teacher". However, the teachers noted that they became more patient and understanding of the target children as their knowledge, understanding and confidence increased. This may have contributed to improved relationships between the teachers and the children they were working with.

There are several limitations that should be considered when interpreting the results of this research. First, the study was limited to a purposefully selected cohort of early childhood teachers and only three teachers participated in the interviews. It is therefore possible that the perceptions of these teachers would not match those of other teachers. The small sample size also means that "saturation" of the data may not have been obtained (Fusch, & Ness, 2015). This means that the inclusion of more participants may have produced new or relevant information that was not obtained in the current research. Likewise, only one coach was involved in delivering the coaching programme and it is possible that different results may have been achieved had it been delivered by a different coach or multiple coaches. It may be useful for future research to include a larger sample of teachers and/or multiple coaches. Overall, the generality of the present results can only be fully evaluated by comparing the present findings to the larger pool of yet-to-be conducted studies. On the other hand, the findings are generally consistent with the admittedly small number of similar studies (e.g., Knoche et al., 2013; Waddington et al., 2020a).

It is also possible that data were affected by a social desirability bias, which is defined as "the pervasive tendency of individuals to present themselves in the most favorable manner" (King & Bruner, 2000, p.80). Social desirability bias is a risk with any self-report data, but the risk was especially high in the present research because the same researcher delivered the coaching and conducted the interviews. It was decided that the researcher's

knowledge of the participants and the coaching process would be valuable in conducting the interviews, however it is possible that teachers would have been more likely to share negative responses had a neutral person conducted the interviews. Nonetheless, all teachers' responses included details of things that did not work and things that they felt could have been done better, perhaps indicating that teachers were comfortable to share answers that could have been perceived as negative. Future studies could involve interviews conducted by individuals who do not have any involvement with the coaching programme.

Finally, the current research used only one method to explore teachers' perceptions of the intervention. Richer data could have been obtained through the use of methods triangulation which is the use of multiple data collection methods. For example, teachers could have been asked to keep a diary during the coaching process which could have been analysed and used to complement and/or contrast interview data.

To conclude, in general teachers perceived the coaching programme and ESDM strategies to be both acceptable and effective. However, specific elements of the coaching programme and specific ESDM strategies were viewed as more acceptable and effective than others. Teachers also offered a range of suggestions regarding how the intervention could be improved. In addition, there were a number of limitations related to the methodology of the present research that may compromise the validity of the present findings. Nonetheless, this research could be viewed as providing preliminary support for the social validity of the focus intervention for this group of teachers. It seems important for future research to address the identified limitations in the present research and to examine in further detail the social validity of this intervention for ECE teachers in inclusive preschool settings.

CHAPTER 7
GENERAL DISCUSSION

The specific research questions addressed in this thesis were:

1. Can a certified Early Start Denver Model (ESDM) therapist use ESDM techniques with a high degree of fidelity in an inclusive preschool environment, without undertaking any major changes to the regular preschool routines or environment?
2. For three preschool-aged children with autism spectrum disorder (ASD) who are attending an inclusive preschool setting, will implementation of the ESDM by a trained therapist for 3 hours per week over 10 weeks lead to improvements in individually defined social and communicative behaviours for each child?
3. For three teachers working with children with ASD in an inclusive preschool setting, will participation in a coaching programme lead to improvement in their use of ESDM strategies?
4. Will teachers' participation in the coaching programme lead to increases in individually defined social-communication behaviours for the children with ASD that they teach?
5. After completing the training process and using the ESDM strategies, will teachers rate the training process and intervention as acceptable and effective using the TARF-R and in-depth individual interviews?

Main Findings

Previous research has established that early intervention (EI) can be effective in improving a range of outcomes for young children with autism spectrum disorder (ASD; e.g. Debodinance et al., 2017; Eldevik et al., 2009; Reichow, 2012; Vismara & Rogers, 2010; Warren et al., 2011). Delivery of EI in an inclusive preschool setting appears to offer several potential benefits and previous studies have demonstrated that EI delivered in this context can have a positive impact on child outcomes (Tupou et al., 2019). However, many communities do not seem to have the level of resource that is typically seen in EI research studies (Liptak et al., 2008; Singh & Garrett, 2019; Thomas et al., 2007) and thus the positive findings from previous studies may not be replicated when research is conducted in real-world preschool settings in these communities. The two studies in the present thesis sought to evaluate the use of the Early Start Denver Model (ESDM) in a real-world inclusive preschool setting with teacher-child ratios of 1:10 to 1:15. In Study 1, three children with ASD received three hours per week of intervention for 10 weeks. The intervention was delivered by an ESDM- trained therapist, in the children's regular preschool environments. In Study 2, three regular

preschool teachers were trained to use ESDM techniques with children with ASD at the inclusive preschools where they worked. Each teacher received one hour of coaching per week for 10 weeks based on an adapted version of the ESDM parent coaching programme.

The results of Study 1 were generally positive for all three children. After receiving 10 weeks of direct therapy from a certified therapist, all children showed increased levels of active participation (AP) and two of the three children showed increased use of intentional vocalisations/functional utterances. Results for imitation were not as positive as only one child demonstrated a clear improvement and the remaining two participants showed only a minimal increase in their use of imitation. The improvements observed during the intervention phase were generally maintained at follow-up. Findings also indicated that it was feasible for an outside therapist to deliver the intervention with fidelity, without the need for major changes to the existing preschool environment or routines.

In Study 2, all three participating teachers improved in their use of the ESDM strategies after receiving 10 teacher coaching sessions. These improvements were generally maintained at follow-up. However, only one teacher reached the 80% fidelity level, which is considered the minimum level required to be 'at fidelity' when delivering the ESDM (Rogers & Dawson, 2010). Further, teachers' participation in the coaching programme was associated with improvements in AP for all three participating children. Two children also showed improvement in their use of intentional vocalisations. However, improvements in imitation were only minimal for all children. Follow-up data indicate that gains made during intervention were generally maintained over an 11-week period following the end of the coaching programme.

In terms of social validity, teachers generally reported that they found the intervention to be both acceptable and effective. Teachers also reported that some elements of the coaching programme and specific ESDM strategies were more acceptable and effective than others. For example, teachers reported hands-on practice to be the most valuable element of the coaching programme and strategies such as using pauses to elicit communication and encouraging eye contact to be the most useful ESDM strategies. Teachers also offered a range of suggestions regarding how the intervention could be improved. Specifically, teachers suggested that future coaching programmes should include more targeted coaching and support around the use of behavioural teaching strategies and more time for one-on-one practice with target children.

The following sections will discuss these results in relation to the research questions outlined in Chapter 3 and at the beginning of this chapter. Specifically, the feasibility,

effectiveness (in terms of child and teacher outcomes) and social validity of inclusive preschool-based delivery of the ESDM will be discussed. Limitations and implications of the present studies and suggestions for future research will also be discussed.

Feasibility of Inclusive Preschool-Based Delivery of the ESDM

The findings from Study 1 and Study 2 suggest that it might be feasible to deliver the ESDM in a typical inclusive preschool without the need for major changes to the typical preschool environment or routines. In Study 1, an outside therapist, who was trained in the use of the ESDM procedures, was able to deliver the intervention with what could be viewed as an acceptable level of fidelity (her mean level of correct implementation was 89%). In Study 2, teachers used the ESDM procedures with an average fidelity level of 67% after participating in the coaching programme. Teachers also reported that they did not need to use planning or resources beyond what they would use in their typical teaching practice. This suggests that the ESDM might be feasible for use by trained therapists and by coached teachers in regular inclusive preschool settings. This is significant because the present studies were undertaken in regular community preschools with limited access to specialist staff and teacher-child ratios of 1:10 to 1:15. These context variables are somewhat different to previous G-ESDM research (Eapen et al., 2013; Fulton et al., 2014; Vinen, Clark, Paynter, & Dissanayake, 2018; Vivanti et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016; Vivanti et al., 2018), where, for example, teacher-child ratios were typically 1:3 to 1:5 and where implementation staff included specialists such as speech language pathologists or special education teachers. In addition, in previous G-ESDM studies, the preschool settings were specifically organised to facilitate intervention delivery, which was not the case in the current research.

It is also promising that teachers from Study 2 improved their use of ESDM strategies after participating in a relatively short, low-intensity coaching programme. This suggests that the coaching approach used in Study 2 might be feasible for use in training regular teachers to use the ESDM with young children with ASD in an inclusive preschool setting. However, it is important to note that none of the teachers in Study 2 reached the 80% level of fidelity for more than two sessions and two of the teachers did not reach 80% fidelity in any of their sessions. This could suggest the need for additional coaching and feedback to ensure teachers reach and maintain higher levels of procedural fidelity.

Previous G-ESDM studies have reported that educators were able to implement the ESDM with fidelity in preschool settings (e.g. Eapen et al., 2013; Fulton et al., 2014; Vinen et al., 2017; Vivanti et al., 2013). However, it is difficult to make direct comparisons between

these studies and Studies 1 and 2 of the present thesis because Studies 1 and 2 used a modified version of the original ESDM fidelity scale that was used in previous studies. Specifically, minor modifications were made to original the scale to make it more operational for research. Further, most previous G-ESDM studies did not undertake ongoing/repeated measures of educator fidelity and so it is not possible to determine the extent to which fidelity was maintained at high levels as the intervention progressed. For example, in four studies (Eapen et al., 2013; Fulton et al., 2014; Vinen et al., 2017; Vivanti et al., 2013), the authors stated that all preschool staff were certified in the ESDM before the study began and received ongoing supervision from ESDM trainers, but it appeared that no specific measures of fidelity were conducted during the intervention phase. In a further two studies (Vivanti et al., 2013; Vivanti et al., 2014), core staff members were certified during the first semester of the intervention. These staff also received ongoing supervision from ESDM trainers and had their fidelity measured approximately 6 months later. Fidelity was reported to be at acceptable levels for all staff. In the final study (Vivanti et al., 2018), staff received ongoing coaching and training from certified ESDM trainers over a 3-year period, with fidelity monitored at least twice during each school year. Fidelity levels were reported as acceptable for staff in the specialised setting but staff in the inclusive setting did not reach the 80% threshold until the third year of intervention. The authors suggested that the lower fidelity levels in the inclusive setting illustrated the challenges associated with implementing the ESDM in an inclusive preschool environment. This would seem to fit with the findings from Study 2 in that the teachers in Study 2 did not reach and/or maintain the 80% fidelity level during the 11-week coaching programme. Again, this suggests there may be value in providing additional or more intensive coaching and feedback.

However, the challenges associated with the inclusive preschool environment may not be the only explanation for teachers' lower fidelity levels. Indeed, in Study 1, a certified therapist was able to maintain a fidelity level above 80% in this type of environment. It is possible that the teachers from Study 2 had lower overall fidelity rates than the therapist from Study 1 because they had additional responsibilities such as supporting other children, speaking with parents and managing preschool routines. These extra responsibilities may have impacted upon teachers' ability to use the ESDM strategies with fidelity. Indeed, when interviewed, teachers suggested that many of the challenges they faced when using the ESDM strategies centred around the demands of the busy kindergarten environment. For example, teachers described times when the need to support another child or help with a kindergarten routine superseded their use of the intervention with the target child.

On the other hand, it is possible that the teachers did not use the ESDM strategies to the same extent because they had not received the same level or quality of training as the interventionist in Study 1. Specifically, in Study 1, the interventionist received extensive training and supervision from a certified ESDM trainer prior to implementing the intervention. In contrast, the teachers in Study 2 received only a brief coaching programme, delivered by an ESDM therapist with no formal training or coaching qualifications. It is possible that a longer, more thorough coaching programme may have helped the teachers in Study 2 to have reached the 80% fidelity threshold. Likewise, it is possible that delivery of the coaching programme by a person who was more qualified and/or experienced in coaching might have led to higher levels of fidelity for the teachers in Study 2.

Child Outcomes

All six children who participated in Studies 1 and 2 made improvements on at least one child dependent variable. Across both studies, all children showed improvements in AP, but improvements in intentional vocalisations/spontaneous functional utterances (from here on referred to as vocal/verbal outcomes) and imitation were mixed. Specifically, some participants made notable improvements in these latter two areas, while other participants' improvements could be seen as relatively modest. Due to the heterogeneity of ASD, it is common to see variability in children's responses to intervention (Stahmer et al., 2011). This is perhaps even more likely when the intervention is implemented under the real-world conditions of an inclusive preschool setting. In such applied educational settings, a child's response to intervention could be influenced by many different factors arising from the complexities of the setting, such as the presence of peers and other teachers or the unpredictable physical environment (Guldberg, 2017).

It is also possible that some child behaviours may be easier to target than others and this may go some way in explaining differences in child improvements across different outcomes. For example, it may be simpler to target an increase in behaviours that are already in a child's repertoire rather than teaching new behaviour (Rogers & Dawson, 2010). This is because the teaching of new behaviours is likely to require explicit, systematic instruction which may be difficult to provide in the preschool environment where there are many potential distractions to teaching and learning. Further, behavioural teaching techniques (e.g. provision of clear cues, the use of prompting to elicit behaviour and contingent reinforcement) are likely to play an important role in teaching new behaviours to children with ASD (Rogers & Dawson, 2010). Therefore, the extent to which these techniques were used with fidelity may have impacted upon the children's learning of new skills. In the

present studies, it is possible that children already had the skills required to actively participate but were not using them frequently prior to the intervention. Thus, improvements in AP may reflect an increase in the frequency with which children used these skills, rather than that they learned a new behaviour. Indeed, in Study 2 participants made significant improvements in AP despite their teachers using the ESDM instructional techniques with relatively low levels of fidelity. On the other hand, verbal/vocal outcomes and imitation may have been new skills that required explicit teaching. It is therefore possible that teachers' relatively low fidelity levels with respect to using some of the behavioural ESDM strategies may have negatively impacted upon child improvements on imitation and verbal/vocal outcomes in Study 2. Teachers' use of individual ESDM strategies is discussed in further detail in the **Teacher Fidelity** section below.

Learning a new behaviour may also take more time than increasing the consistency with which an already acquired behaviour is used. This is likely to be especially true for learning new complex behaviours such as language where development tends to occur in stages over time (Rogers & Dawson, 2010; Talbott et al., 2018). It may therefore be difficult to show progress in these types of behaviours in studies conducted over a relatively short time period, such as Studies 1 and 2. This appears to be the case for some of the participants in the present studies. For example, Ricky's overall data indicate only a minimal improvement in his use of IVs, however his final intervention data point showed an increase that continued into his follow-up phase. If this trend had continued over a longer intervention phase, Ricky may have made an eventual significant improvement in IVs. Similarly, overall data suggest that Jordan made only minimal improvement in imitation however, there was an increasing trend for the final 3 data points of his intervention phase. Again, a longer intervention phase may have led to an eventual significant improvement in Jordan's imitation.

Another possibility is that child outcomes were mediated by certain participant characteristics, such as the child's age at the start of intervention or severity of ASD symptoms. Several potential mediating variables have been proposed to explain variations in treatment outcomes for children with ASD. For example, Vivanti et al. (2016) and Vivanti et al. (2018) found that child improvements in verbal outcomes were negatively correlated with age at start of treatment for children receiving G-ESDM. In contrast, Vivanti et al. (2013) found no relation between child age at initiation of treatment and subsequent treatment outcomes. They did however find that children's imitation skills, ability to use objects functionally and understanding of others' goal-directed actions with objects were predictive

of gains on measures of verbal and non-verbal cognition. While there does not appear to be a relation between age and outcomes in the present studies (e.g., Ricky was the youngest participant, but he did not make the most improvement), it is possible that other participant characteristics, such as imitation skills or ability to use objects functionally, played a mediating role in the effectiveness of the present intervention. However, it is not possible to determine mediating child characteristics in the present studies due to the small number of child participants.

Overall, the child participants in Study 1 appeared to make greater improvements than the children involved in Study 2. Specifically, for AP, the mean improvement from baseline to intervention for Study 1 participants was 40 percentage points (range = 32 to 50 percentage points). This is far greater than the mean improvement of 16 percentage points for Study 2 participants (range = 12 to 22 percentage points). For vocal/verbal outcomes, Study 1 participants made a mean improvement of 17 percentage points (range = 5 to 27 percentage points), compared to a mean of 8 percentage points (range = 2 to 11 percentage points) for Study 2 participants. Finally, for imitation, Study 1 participants made a mean improvement of 8 percentage points (range = 4 to 15 percentage points) compared to a mean of 3 percentage points (range = 2 to 4 percentage points) for Study 2 participants. Overall, the mean improvement for Study 1 participants was more than double the mean improvement for Study 2 participants on all variables.

It is possible that Study 1 participants made greater improvements than Study 2 participants because their intervention was delivered with a higher level of fidelity. Indeed, research suggests that higher levels of interventionist fidelity may be associated with improved outcomes (Detrich, 1999; Kern, & Aldridge, 2006; Mandell et al., 2013; Perepletchikova, & Kazdin, 2005; Strain, & Bovey, 2011). It is also possible that Study 1 participants received a greater dose of the intervention than Study 2 participants. Specifically, while the therapist in Study 1 delivered three, 60-min intervention sessions per week. It is not clear if the teachers in Study 2 provided this same level of intervention hours per week. Unfortunately, the amount of intervention hours provided by teachers in Study 2 could not be directly measured because of practical constraints, but it is possible that the teachers in Study 2 were not able to deliver three hours of uninterrupted intervention per week. Indeed, comments made by the teachers during the interviews suggested that teachers used the ESDM strategies ‘in the moment’ and their use of these strategies was often interrupted by other demands from within the preschool environment. Further, all teachers indicated that they would have liked more time to use the intervention procedures with the target children.

Previous studies have demonstrated an association between EI intensity and child outcomes, suggesting that a greater intensity of intervention may lead to greater child improvements (e.g. Granpeesheh, Kenzer, & Tarbox, 2011; Lovaas 1987). However, comparisons are typically made between higher intensity (15+ hours per week of intervention) versus lower intensity (less than 15 hours per week of intervention). It is unclear if other intensity levels (e.g., 3 hours per week versus 6 hours per week) would have an impact on child outcomes. Nonetheless, it seems to make logical sense that more intense intervention might lead to better outcomes as children receiving the more intense intervention would theoretically receive more targeted adult attention and learning opportunities.

Interestingly, the teachers in Study 2 often perceived the intervention to have been more effective than the objective data on the children's outcomes indicated. For example, Kelly reported that she noticed significant improvements in Ricky's vocal communication during the intervention, while the observational data on Ricky's use of intentional vocalisations showed that there was relatively minimal improvement on this variable for Ricky. Research suggests that parent/teacher reports on child outcomes are not always accurate and may be subject to a "placebo by proxy" effect (Sandbank et al., 2019), which may account for these differences. However, it is also possible that the child outcome measures used in the present studies did not fully/accurately capture child improvements. Findings related to each of the three child outcomes (active participation, imitation and vocal/verbal outcomes) are discussed separately below.

Active Participation (AP)

For both studies in the present thesis, AP was the dependent variable where children demonstrated the greatest improvements. It is also the only outcome where all six participants showed improvement. These results might be seen as promising given that AP might be assumed to be of importance for other areas of learning. In the present studies, AP was essentially a measure of engagement that included interaction with others. This type of engagement is recognised as an important vehicle for learning in a range of different learning areas including learning tacit skills and knowledge such as acceptable social practices, routines and unspoken rules (Williams & Williams, 2001).

Increases in AP could also be viewed as important because this might have provided participating children with greater opportunities to learn from typically developing peers, which is a key rationale for the inclusion of children with ASD in regular preschools (Koegel, Koegel, Frea & Fredeen, 2001; Vivanti, Duncan, Dawson & Rogers, 2017). Some research suggests that within the preschool environment, children with ASD may be less likely to

initiate interactions with peers or respond appropriately to their peer's initiations (Gunning, Breathnach, Holloway, Mctiernan, & Malone, 2019; Pierce & Schreibman, 1997) and as a result they may miss out on many potential learning opportunities. An increase in AP could be viewed as reflecting an increase in the time spent interacting with others and might therefore indicate that the participating children had access to important social learning opportunities that they may have otherwise missed. Indeed, teachers from Study 2 reported in their interviews that they observed improvements in the target children's interactions and relationships with peers. Unfortunately, the method of measuring AP in Studies 1 and 2 did not distinguish between peer-related AP and teacher-related AP, so no firm conclusions can be drawn regarding the impact of the intervention on peer interactions.

It is important to note that, when consulted regarding child goals at the beginning of each study, parents and teachers all indicated that they wanted the children to be more actively involved with peers and kindergarten activities. Improvements in AP would therefore seem to have some social validity because increasing AP corresponded with parent and teacher priorities (Barton, Meadan-Kaplansky, & Ledford, 2018; Horner et al., 2005). Further, the teachers from Study 2 described the increased participation of the target children as one of the most rewarding aspects of the intervention. This again suggests that improvements in AP were important to teachers and thus had some social validity.

Finally, it is promising that improvements in AP were observed in all participants in Study 2, despite teachers' lower fidelity levels. This may suggest that children's AP levels can be improved even when ESDM is delivered at less than 80% fidelity. It is also possible that it is not necessary for interventionists to use every ESDM strategy to improve child levels of AP. Indeed, in their analysis of mothers' use of ESDM strategies during a parent training programme, Waddington et al. (2020b) found that child engagement was positively correlated with the mothers' use of several specific ESDM strategies. Specifically, the authors reported a significant positive correlation between mothers' use of attention management strategies and child engagement for all five participating mother-child dyads. There was also a strong positive correlation between child engagement and mothers' use of dyadic engagement, sensitivity and responsivity and positive affect for some of the mother-child dyads. In Study 2, positive affect and sensitivity and responsivity were among the strategies used with the highest levels of fidelity for all three teachers. Based on the findings from Waddington et al. (2020b), it is possible that teachers' use of these strategies positively impacted upon child improvements in AP. Teacher's use of the individual ESDM strategies is discussed in further detail in the **Teacher Outcomes** section below.

Vocal/Verbal Outcomes

Overall, child improvements on vocal/verbal outcomes were mixed. Across Studies 1 and 2, three children demonstrated improvement in their use of intentional vocalisations (IVs) and one child improved in his use of spontaneous functional utterances (SFUs). Ian and Ricky showed relatively little gains from baseline to intervention in the vocal/verbal variables. However, Ian had a relatively high level of SFUs during the baseline phase, so it is possible that there was a ceiling effect for him. If this was the case, a measure of the variety or function of his SFUs or his use of SFUs with peers may have provided different results. Ricky's use of IVs showed an increasing trend at follow-up, but relatively little absolute level of change during intervention. This may indicate that for Ricky, verbal behaviour took longer to teach or perhaps that his teacher did not start using strategies for teaching verbal behaviour until later in the intervention. The latter of these two suggestions makes logical sense as Ricky's teacher, Kelly, did not receive the coaching session focussed on encouraging speech until the later stages of the intervention.

While it is not possible to make direct comparisons across studies due to the use of different measurement approaches, several previous studies (D'Elia et al., 2014; Harjusola-Webb & Robbins, 2012; Olive et al., 2007; Strain & Bovey, 2011) have reported improvements in expressive language outcomes for children participating in teacher-delivered EI in inclusive preschool settings. In addition, four previous G-ESDM studies (Eapen et al., 2013; Vivanti et al., 2014; Vivanti et al., 2016; Vivanti et al., 2018) also reported positive language outcomes for children who received preschool-based ESDM. However, one study (Young et al., 2016) found no improvement in expressive language for children participating in an inclusive preschool-based Comprehensive Autism Program (CAP). Thus, collective results suggest that preschool-delivered EI, including ESDM, can be effective in improving child expressive language outcomes but this is not always the case. These collective results appear to correspond with the mixed findings regarding verbal/vocal outcomes for Studies 1 and 2

As previously mentioned, it is also possible that child improvements were mediated by certain participant characteristics. In regard to verbal/vocal outcomes, two previous G-ESDM studies (Vivanti et al., 2016; Vivanti et al., 2018) have proposed a negative correlation between child age at the start of intervention and gains in verbal developmental. Specifically, the authors reported that children aged younger than 48 months tended to make greater gains on verbal outcomes than those aged over 48 months. In contrast, another study (Vivanti et al., 2013) found no relation between child age and verbal cognition outcomes but did report that

children's pre-intervention functional object use, understanding of others' actions with objects and use of imitation was positively correlated with subsequent gains in verbal cognition. Although the sample size in the present studies is too small for drawing conclusions regarding potential mediating participant characteristics, it is possible that child age may have impacted upon child improvements on verbal/vocal outcomes. Specifically, 5 of the 6 participating children were older than 48 months so, in line with findings from Vivanti et al. (2016; 2018), it is possible that younger children may have made greater gains in verbal/vocal outcomes.

There is also evidence to suggest that children who have some speech prior to intervention tend to make greater gains on verbal outcomes than children who enter intervention with no speech (Rogers, 2006). Thus, it is possible that for Studies 1 and 2, children's pre-intervention verbal/vocal abilities mediated their progress on this outcome. Finally, it is worth noting that an estimated 25 – 30% of individuals with ASD may never develop productive speech (Talbott et al., 2018). It is therefore possible that for this subset of the ASD population, intervention may not lead to improvements on verbal outcomes.

Imitation

In contrast with the promising results in AP, five of the six participating children made only minor improvements in imitation. This is surprising given that the ESDM directly targets imitation (Rogers & Dawson, 2010). It is also concerning given the importance of imitation to social relationships and other areas of learning, most notably communication and language (Gordon et al., 2020; Ingersoll, 2008; Wadsworth et al., 2017).

Ian (from Study 1) was the only child to show a notable improvement in imitation. It is interesting to note that prior to the intervention, Ian also had the highest level of adaptive behaviour functioning, as measured by the VABS-3 (Sparrow et al., 2016) and the highest levels of AP and verbal communication. There is some research suggesting an association between imitation, language and joint attention development (Ingersoll, 2008), so it is possible that Ian's higher levels of development in these areas facilitated his progress in imitation during the intervention. This raises the possibility that, in terms of teaching imitation, the present intervention may be better suited to children who enter the programme with relatively higher levels of adaptive behaviour functioning and/or language.

Vivanti et al.'s (2018) study is the only previous G-ESDM study to have included imitation as a child outcome. The authors reported an overall improvement in imitation for children in both the inclusive and specialised settings after 11-months of G-ESDM intervention. This may suggest that a longer duration of the G-ESDM could lead to

significant improvements in imitation. Indeed, in Study 1 of the present thesis, all participants had increasing trends during the intervention phase and Ian's use of imitation further increased during follow-up. However, imitation was measured differently in the present thesis than it was in the Vivanti et al. study. Specifically, in the present study imitation was measured using interval recording and naturalistic video recordings taken during unstructured play sessions at preschool. In the Vivanti et al. study it was measured using a structured experimental task where children's behaviour was scored using a pre-determined points system.

One previous study conducted in an inclusive preschool (i.e., Garfinkle & Schwartz, 2002) evaluated the effectiveness of a targeted peer imitation intervention delivered by teaching staff to four young boys with ASD. Results of this study showed some improvements in participants' spontaneous imitation of peers after daily 15-min intervention sessions (the duration of the intervention was not specified, but data were collected over 61 days). However, direct comparisons between this study and Studies 1 and 2 are not possible because of the use of different methods to measure imitation. The differences were that in the present studies imitation of adults and/or peers was measured, whereas in the Garfinkle and Schwartz study, only imitation of peers was measured. Also, in the present studies, data was collected via10-min video recordings whereas Garfinkle and Schwartz used live coding and 5-min samples. Still, the more positive results in the Garfinkle and Schwartz study may indicate some benefit in using a targeted intervention for imitation and/or utilizing peers in imitation training.

Teacher Outcomes

The teachers in Study 2 showed improvement in their correct use of ESDM strategies during the intervention. Helen's fidelity during intervention was on average 73% higher than her average baseline fidelity level. This represents the largest improvement across all the teachers. Helen also had the highest baseline fidelity level for a single session (55%). Kelly's use of the ESDM strategies improved 31% from baseline to intervention and Bear showed a 41% baseline to intervention improvement. Kelly and Bear both showed further improvements in fidelity from intervention to follow-up, while Helen showed a slight decrease. A myriad of factors might explain the differences in teachers' responses to the intervention and separating out such factors is especially difficult given the complex nature of the preschool environment. While determining reasons for differences in individual teachers' responses to the coaching intervention is difficult, it is possible that certain child characteristics might be relevant. For example, Helen was the teacher for Tama, who had the

highest AP and vocal/verbal levels in baseline. Tama also made the biggest improvements on these outcomes during intervention. Tama's baselines levels of AP and vocal/verbal behaviours might have made it easier for Helen to use the intervention with him and this might have contributed to Helen's higher fidelity and also to her perceptions of the intervention as being effective. There is evidence to suggest that when an intervention is perceived as effective, it is more likely to also be perceived as acceptable and thus more likely to be used with fidelity (Perepletchikova & Kazdin, 2005).

Data from Study 2 indicate some variation in the extent to which teachers used each of the ESDM strategies with fidelity during the intervention phase. Specifically, teachers appeared to use several of the more developmental/relationship-focussed strategies (e.g. modulating child affect and arousal, using positive affect and sensitivity and responsivity) with higher levels of fidelity and some of the more behaviourally-focussed techniques (e.g. instructional techniques, and managing transitions between activities) with lower levels of fidelity. One explanation for this is that the developmental/relationship-focussed strategies fit more naturally into the teachers' existing teaching practice. Indeed, in their post-intervention interviews teachers described some of these strategies as feeling natural and easy to use. Further, during baseline all three teachers were using modulation of child affect and arousal with 100% fidelity and positive affect with 80 – 100% fidelity. This suggests that these two strategies were already a part of the teachers' regular teaching practice. In contrast, it is possible that the ESDM instructional techniques were not a part of the teachers' regular teaching practice. Teachers reported during interviews that they found these techniques difficult to learn and/or use and baseline data indicates that teachers were using these techniques with only 0 – 17% fidelity prior to intervention.

Similarly, interview data suggest that teachers felt that they improved in their overall understanding and use of the ESDM strategies but their perceptions varied across the individual techniques. Teachers were unanimous in their perception of the behavioural techniques as challenging to learn and/or use. Teachers also commented that there were aspects of the behavioural strategies that they had not been able to use successfully with the target child. This suggests that teachers may have perceived these techniques to be less acceptable than some of the other ESDM techniques. Behavioural teaching techniques are considered key to teaching in the ESDM (Rogers & Dawson, 2010) and their efficacy in teaching new skills to young children with ASD is well-established in the research literature (Wong et al., 2015). It is therefore concerning that teachers did not perceive some of these behaviourally-based strategies more positively because this might indicate that they were less

likely to use them consistently after the formal intervention programme ended. Indeed, research suggests that interventionists are more likely to use an intervention faithfully when they regard that intervention positively (Perepletchikova & Kazdin, 2005). It is also possible that teachers' perceptions regarding the acceptability of these strategies may have improved if they had been provided with more time and opportunity to learn and practice them.

Teachers' difficulties with respect to understanding and using the behavioural techniques of the ESDM might also go some way in explaining the lack of child progress on imitation and vocal/verbal outcomes as there is evidence to suggest that these skills may not develop naturally in young children with ASD and may require direct teaching using behavioural teaching procedures (Rogers & Dawson, 2010). Thus, teachers may need to correctly use the behavioural teaching techniques from the ESDM in order to ensure the child makes clinically significant improvements in these areas.

The intervention also appeared to have a positive impact on teachers' knowledge about and confidence in working with the target children and other young children with ASD. Results from the teacher exit surveys in Study 2, suggested there were improvements in Kelly and Helen's self-rated knowledge, confidence and skill levels. This was also reflected in their interview responses. However, Bear's results on the surveys showed a decrease in her confidence and skill levels between the entry and exit surveys. During Bear's interview, which was conducted 11 weeks after she completed the exit survey, she described how she had initially found the intervention overwhelming, but her sense of confidence had increased after having had time to practice after the coaching programme ended. Together these results could suggest that Bear's perception of her skill and confidence levels was impacted by her feelings of being overwhelmed by the need to learn many new skills in order to implement the ESDM procedures. However, after a period of practicing in her own time and space, her perceptions did appear to have improved.

Social Validity

With community-based interventions, such as the ESDM intervention that was evaluated in the present thesis, the individuals who are responsible for implementing the intervention (e.g. the teachers in Study 2) are likely to have a large influence over whether the intervention is used and the extent to which it is used as intended (Dingfelder & Mandell, 2011). It therefore seems important to consider the perceptions of these individuals regarding the acceptability of the intervention. Indeed, when an individual perceives an intervention to be acceptable, they are more likely to use it with fidelity (Perepletchikova & Kazdin, 2005). This is likely to have important implications for the long-term viability of community-based

interventions where the ultimate goal is for communities to be largely self-sustaining in their delivery of the intervention. It is promising then that overall, the teachers from Study 2 rated the intervention as highly acceptable.

According to Perepletchikova and Kazdin (2005), interventions are more likely to be perceived as acceptable if they involve positive techniques (e.g. positive reinforcement, positive affect) instead of negative procedures (e.g. verbal reprimands, time-out and other punishment procedures). It is possible then that teachers from Study 2 were more likely to view the intervention as acceptable because the ESDM emphasises the use of positive techniques. According to interview responses, teachers also viewed the ESDM procedures as very effective. Intervention procedures are also generally perceived more positively if the procedures are viewed as effective (Perepletchikova & Kazdin, 2005).

The teachers from Study 2 also highlighted parts of the intervention that they viewed as less acceptable. These appeared to centre around the challenges of using the intervention within the busy preschool environment and the difficulties associated with learning and using certain specific (behavioural) techniques. There were also a number of practical suggestions offered by teachers that they felt would minimise these challenges, and thus make the intervention more acceptable in the future. Suggestions included providing teachers with extra support staff and/or release time, providing a separate space for teachers to use for one-on-one work with the child, providing more and/or clearer instruction around the use of specific behavioural teaching techniques and providing a range of strategies for dealing with unwanted behaviour to enable teachers to select a strategy that best suits them and the child they are working with. Some of these suggestions may be easier to accommodate than others. For example, it would seem relatively simple for future coaching programmes to provide video examples of teachers using different behavioural techniques, practical written examples of how the techniques might be used, and/or extra coaching sessions to better prepare teachers to use the behavioural techniques. On the other hand, the provision of a separate space and extra teacher release time may be more difficult to achieve and may be dependent upon changes at an administrative/policy level. Nonetheless, it is possible that the social validity of the present intervention could be enhanced through the inclusion of these suggestions in future interventions.

Contributions to the Research Literature

There are several ways in which the studies in this thesis contribute to the existing literature. Firstly, the collective results would seem to add important new data from the unique New Zealand context to the existing G-ESDM research base. While previous studies

have evaluated the G-ESDM when implemented by specially trained staff in designated ESDM preschools with relatively low child-teacher ratios, the studies in the present thesis have demonstrated the feasibility of using this intervention within regular inclusive preschool routines and environments and with much higher child-teacher ratios. This ties in with current priorities in the field of ASD research which emphasise the need for research focussed on the effectiveness of interventions implemented in real world settings (Nahmias et al., 2019). Further Study 1, and to a lesser extent Study 2, provide preliminary evidence of the effectiveness of the present intervention approach in terms of improving child outcomes.

The social validity data collected in Study 2 also contributes to existing G-ESDM research by adding information regarding the acceptability of the ESDM model in inclusive preschool settings in New Zealand. Only one previous G-ESDM study (Vivanti et al., 2014) has reported on educators' views regarding the acceptability of the intervention. Perceptions of educators using the G-ESDM in an ASD-specific preschool were measured via a survey designed specifically for that study and results indicated that more than 80% of the staff rated the intervention as highly acceptable. Study 2 added to and expanded upon these findings by providing interview data that may help in developing a greater understanding of teachers' perceptions of specific elements of the intervention along with factors that might influence these perceptions.

This social validity data also adds to existing research on early childhood education (ECE) teacher coaching and teacher-delivered inclusive preschool-based EI. Indeed, many previous studies in both of these areas have failed to include a measure of social validity (Artman-Meeker et al., 2015; Tupou et al., 2019). The findings from Study 2 contribute to this limited evidence-base by providing standardized ratings (using the TARF-R) and more open-ended data interview data on teachers' perceptions of the intervention. Both types of information are likely to be important in the design and delivery of future teacher coaching programmes and research projects. For example, findings from Study 2 suggest that teachers found the ESDM strategies useful for many of the children that they worked with (including children who did not have ASD), so future coaching programmes could take a broader approach to support teachers in using the intervention with a range of children, rather than just one target child. Similarly, future research could evaluate the effectiveness of the intervention when used with multiple children or with children who do not have ASD.

Studies 1 and 2 could also be viewed as contributing to the evidence-base that supports the use of ESDM as an EI programme for young children with ASD. Capes et al. (2019) recently highlighted the need for more community-based ESDM research and Studies

1 and 2 would seem to go some way in addressing this need. To the author's knowledge, these studies are also the first studies to evaluate low-intensity ESDM outside of a home or clinical setting. The use of the P-ESDM coaching approach to train teachers could also be seen as a novel addition to the literature. The success of the coaching approach in improving teachers' use of ESDM strategies in Study 2 could be viewed as providing some indication of the effectiveness of this coaching approach.

It could also be argued that Study 2 extends the existing base of research on teacher-delivered comprehensive intervention for young children with ASD in an inclusive preschool setting. Despite an emphasis on the importance of young children with ASD receiving comprehensive intervention that targets a number of ASD symptoms, much of the existing ASD intervention research focusses on one or a small number of more specific characteristics. These can be seen as more targeted and less comprehensive interventions. This appears to be especially so for evaluations of interventions delivered by teachers in an inclusive preschool setting. Indeed, the literature review conducted as part of this thesis identified only seven studies evaluating teacher-delivered comprehensive EI in this type of setting (Boulware et al. 2006; D'Elia et al. 2014; Eikeseth et al. 2012; Eldevik et al. 2012; Schwartz et al. 2004; Strain and Bovey 2011; Young et al. 2016). On the positive side, the results from these studies suggested that comprehensive interventions can be effectively delivered in an inclusive preschool setting, leading to some improved outcomes for young children with ASD. Study 2 adds to this emerging evidence base by providing further support for the feasibility and potential effectiveness of recruiting teachers to deliver comprehensive EI within inclusive preschools.

Furthermore, Studies 1 and 2 could be seen as adding to the limited number of current studies evaluating EI for ASD in the New Zealand context. It is important for the effectiveness of intervention approaches to be assessed in the contexts where the interventions are going to be used (Nahmias et al., 2019). This is because it is likely that communities will have different needs, capacities and/or preferences, which may impact upon the extent to which different approaches are adopted and effective within each community (Dingfelder & Mandell, 2011). It therefore seems important for interventions, such as the ESDM, to be evaluated in the New Zealand context to inform New Zealanders' use of said interventions. Similarly, the ethnically diverse sample of participants from Studies 1 and 2 provides a contribution to the existing ASD research literature, which has traditionally been conducted with samples lacking in ethnic diversity (Smith & Iadarola, 2015). Specifically, Pākeha, Fijian-Indian, Māori, Niuean and Filipino ethnic groups were represented across the

two studies. Thus, results suggest that the ESDM procedures may be relevant for individuals from a range of ethnic backgrounds.

Implications

Several implications for practice can be drawn from the findings of Studies 1 and 2. Perhaps most significantly, the findings suggest that delivery of comprehensive EI for ASD is feasible within the constraints of a typical inclusive preschool setting. This is significant because many communities do not have access to the resources required to rearrange preschools for intervention delivery or to provide all teaching staff with in-depth intervention training. Further, it appears from some preliminary data that some New Zealand families desire more EI for their child with ASD (Kasilingam et al., 2019), however issues with access and affordability are major barriers for families. Many young children with ASD in New Zealand already attend preschool (Education Counts, 2019) so delivery of EI within this type of setting, using existing resources may help to make EI more accessible and affordable for families.

In terms of comparing teacher-delivered intervention with delivery by an outside specialist, findings from the present thesis suggest that delivery by an outside specialist (Study 1) was more effective in improving child outcomes than delivery by teachers (Study 2). However, delivery of EI by regular teaching staff is likely to be more cost-effective (Lawton & Kasari, 2012) and may enable communities to become largely self-sufficient in their delivery of EI. Further, teachers should theoretically be able to deliver a greater intensity of intervention as they spend more time working with the child. Given the potential advantages to both approaches to delivery, the findings from this thesis would seem to suggest that there may be value in combining both approaches with a view of maximising the effectiveness of the intervention while minimising the need for specialist input. Outcomes from teacher-implemented ESDM might also be improved by providing additional coaching and feedback to teachers.

Finally, Study 2 also highlights the potential value of providing teachers with the training required to effectively support children with ASD in an inclusive environment. The teachers in Study 2 were all experienced, qualified teachers but indicated that, prior to the intervention, they at times felt lost in knowing the best way to support the target children. This appears to be consistent with previous studies that have found that many teachers feel unprepared to support children with ASD in an inclusive environment. However, the results of Study 2 also suggest that a brief coaching programme, requiring relatively little professional input lead to improvements in teachers' use of strategies, and self-rated

knowledge, confidence and skill. Further, teachers' participation in the coaching programme led to some improvements for the young children with ASD that they were teaching. Teachers also reported that they felt better prepared to work with children with ASD in the future and reported benefits in using the ESDM strategies with children without ASD. Thus, the coaching programme used in Study 2 could be viewed as a potentially feasible and cost-effective method for preparing teachers to work with young children with ASD in an inclusive preschool setting. This is likely to be particularly relevant to resource-constrained communities who are not able to provide teachers with intensive, specialised training.

Limitations

The findings from Studies 1 and 2 should be considered as preliminary due to several limitations common to both studies. First, the studies included only a small number of participants so results may not generalize to the wider population of children with ASD and/or the wider population of preschools and preschool teachers. Specifically, all participating children were males aged 3- to 5-years, so it is not known whether similar results would be achieved if this intervention was used with older or younger children or females. Similarly, teachers in Study 2 were all female with more than 5 years teaching experience who volunteered to participate so may have been highly motivated to learn and use the intervention. Thus, it is not known how male teachers, newly qualified teachers or teachers-in-training might respond to the coaching programme. Also, the preschools where the intervention was implemented all belonged to the same organization so it is possible that the positive results from the present studies may not be replicated in other preschools outside of this organization.

Studies 1 and 2 are also limited because there was no direct assessment of generalisation across people or settings for participating children or teachers. Assessment of the generalisation of child behaviours from the interventionist (therapist/teacher) to peers would seem to be especially important. Such a measure is likely to be important because a key rationale for EI delivery in an inclusive setting is the presence of typically developing peers and the opportunities for interaction and communication that these peers may provide. It would also seem important to assess the extent to which teachers were able to use the ESDM strategies with other children because a core argument for recruiting teachers as intervention agents is the potential for them to deliver the intervention to more than one child in the preschool and to continue to use the intervention after coaching support is faded. It may also be of value to measure the extent to which the other (non-participating) teachers at each kindergarten improved in their use of the ESDM strategies.

There are also several limitations related to the measurement and reporting of teacher fidelity. For example, a modified fidelity scale was used to assess interventionist fidelity in Studies 1 and 2. This scale differs from the traditional ESDM fidelity scale which has been used in previous G-ESDM studies, limiting direct comparisons between the present and previous studies. Also, neither the traditional nor the modified fidelity scales specifically measure interventionist fidelity during interactions with peers. This is a limitation because it is likely that management of peer interactions may require different strategies to working one-on-one with a child. There are also no data regarding the validity or reliability of either the traditional or modified fidelity scale. Also, conclusions regarding teachers' use of the ESDM strategies were based upon relatively brief 10-min samples which may not fully represent the teachers' actual use of the intervention.

Similarly, the use of interval recording may not have provided an accurate reflection of child and teacher behaviour. This is because interval recording does not measure the actual frequency or duration of a behaviour, but instead provides an approximation based upon a small sample of time (Barton et al., 2018). Because interval recording provides an estimate of actual frequency, there is the possibility that performances will be either under-estimated or over-estimated. For example, whole-interval recording was used to measure AP in Studies 1 and 2 and this may have resulted in an underestimation of children's AP levels because intervals that contained less than 10-s of child AP were not counted. Despite these possibilities, interval recording was used because it was considered to be the most pragmatic procedure for Studies 1 and 2 given the complexities of the research setting (for example, the unstructured nature of the preschool environment and the presence of multiple communication partners). However, the use of a frequency measure or using shorter observation intervals (e.g. 5-s intervals) may have produced more accurate results.

Studies 1 and 2 were also limited because maintenance data were collected over a relatively short period of time (6 weeks for Study 1 and 11 weeks for Study 2). Further, only two children from each study completed follow-up because the remaining participants (Luke and Tama) transitioned from preschool to primary school before all of their follow-up data could be collected. Thus, any conclusions regarding the long-term use and effectiveness of the intervention effects demonstrated in Studies 1 and 2 are limited. Further, the apparent increasing trends during follow-up for some participants and outcomes may suggest potential benefit in assessing the longer-term impact of the intervention on child outcomes. Along these lines, Ospina et al. (2008) suggested that follow-up periods should correspond with

researchers' predictions regarding the length of time required for the intervention to be effective.

A further limitation relates to the selection and measurement of child outcomes for Studies 1 and 2. Specifically, all child outcomes were proximal, meaning that they measured behaviours or skills that were closely aligned with the targets of the intervention (Yoder et al., 2013). For example, the ESDM specifically targets a child's ability to imitate others, so imitation can be considered a proximal outcome. In contrast, distal outcomes are behaviours or skills that are broader than those that are specifically targeted in the intervention, such as adaptive behavioural functioning or autism severity (Yoder et al., 2013). By measuring these broader outcomes, distal measures provide an indication of the impact of the intervention beyond the direct targets of the intervention (Rogers, Estes et al., 2012) and thus may be valuable in determining whether changes in child behaviour are clinically significant (Spence, & Thurm, 2010). Further, Studies 1 and 2 did not use any standardised outcome measures, this makes it difficult to compare findings with many of the previous intervention studies. Such comparisons are likely to be valuable in enabling parents and teachers to select the most effective method of EI for their child (Ospina et al., 2008).

There were also limitations associated with the use of the Tau-U method to calculate effect size in Studies 1 and 2. Specifically, effect sizes produced using the Tau-U method do not provide any indication of the magnitude of effects, instead they show the likelihood that there was a change between phases. Because of this, it is not possible to use Tau-U values to draw conclusions regarding the clinical significance of observed changes. Further, Tau-U values cannot be compared with effect sizes that are commonly reported in group-design studies (Yoder et al., 2013).

It is also important to note that the researcher took on multiple roles across the two studies in this thesis and this may have limited findings in several ways. For example, in Study 1, the researcher was solely responsible for delivering the therapy. Although the researcher was a certified ESDM therapist and had prior experience teaching preschool and working with young children with ASD, it is possible that different results would have been achieved if the intervention had been delivered by different therapists. Similarly, the researcher was responsible for delivering coaching to teachers in Study 2 and this may have impacted upon the success of the coaching programme. The researcher had no formal experience or training in teacher coaching so it is possible that different results would have been achieved if the coaching had been delivered by a more experienced/qualified coach. Finally, the researcher also conducted the teacher interviews at the end of Study 2. This may

have increased the chances of data being affected by a social desirability bias (King & Bruner, 2000). That is, teachers may have withheld responses that could have been perceived as negative in order to conform with what they thought the researcher wanted to hear. However, teachers all indicated areas of the intervention that were not successful along with suggestions for improvements to the coaching programme which could perhaps be perceived as negative responses.

Another limitation relates to the involvement of parents in Studies 1 and 2. Best practice guidelines in EI for ASD recommend that families should be actively involved in their child's EI (Smith & Iadarola, 2015). However, parental involvement in Studies 1 and 2 was limited. Specifically, parents were involved in identifying priorities and setting goals for their child and the researcher offered to share information on the ESDM strategies with each family. However, it is possible that the intervention would have been more effective if the parents had had more direct involvement with the intervention. For example, parents could have received coaching in using the intervention at home with their child to promote consistency across the home and preschool environments. It would have also been useful to measure parent perceptions of the interventions in Studies 1 and 2.

Future Research

Considering the findings and limitations of the studies presented in this thesis, several directions can be suggested for future research. Firstly, it may be valuable for subsequent studies to evaluate the generalisation of child skills/behaviours to other teachers, peers and/or settings. Based on anecdotal evidence and information shared by teachers during interviews, it appears that child behaviours might have shown some degree of generalisation to peers and other teachers. However, it may be valuable for future studies to directly and objectively measure generalisation. For example, studies could include a measure of generalization to other teachers and peers and, for longer-term studies, from the preschool to the primary school setting. Such research could also investigate factors that have a potential mediating role in the generalisation of behaviours in this type of setting. Information on mediating factors could contribute to the design of future interventions to ensure that generalisation of child behaviours is maximised.

Similarly, teachers from Study 2 reported that their use of the ESDM strategies had generalised to their work with other (non-target) children at the kindergarten, but this was not directly measured. Assessment of the generalisation of teachers' use of the intervention may be important in determining its cost-effectiveness and long-term viability. This is because one of the arguments for teacher-implemented preschool-based EI is the potential for teachers to

deliver intervention to more than one child at a time (Leaf et al., 2018). It was also interesting to note that teachers reported finding the ESDM strategies useful for working with a wide range of different children, not just those with ASD. Future studies could also investigate the effectiveness of the ESDM strategies with children who do not have ASD. Similarly, it may be valuable for future studies to directly measure the impact that the intervention has on the overall preschool environment and teaching quality for all children at the preschool. Researchers might consider using a measure similar to the one used by Vivanti et al. (2018).

It may also be useful for future research to directly compare therapist-delivered ESDM with teacher-delivered ESDM in an inclusive preschool environment. Although the findings from the studies in this thesis suggest that the children who received therapist-delivered intervention in Study 1 made greater improvements than the children who received teacher-delivered intervention in Study 2, no firm conclusions can be drawn without research that directly compares the two approaches. It is also possible that a combination of both approaches, where each child receives some combination of therapist- and teacher-delivered intervention may offer the greatest benefit. It would also be of potential value to compare teachers' and parents' perceptions of each approach to assess whether one approach is perceived to be more acceptable and/or effective than another. Finally, it may be useful for such studies to also include a comparison of the costs involved with each of the approaches.

Another avenue for future research is the impact of the intervention on distal child outcomes such as ASD symptom severity and adaptive behaviour. It may be useful for future research to include distal outcomes alongside the proximal ones used in Studies 1 and 2. Further, the use of standardised tools to measure distal outcomes may allow for comparison with previous studies. Cross-study comparisons may be important in addressing questions regarding which intervention approach is the most effective for a given outcome.

Future research could also explore the impact of different approaches to teacher training/coaching on teachers' use of ESDM strategies and their perceptions of the intervention. For example, it may be useful for future coaching programmes to involve a range of different coaches in the delivery of the coaching programme. It may also be useful for future coaching programmes to include more targeted support around teachers' use of behavioural teaching strategies. Teachers from Study 2 also indicated that they would have liked more coaching time and/or flexibility around coaching. The use of a technology-based teacher coaching programme (e.g. a tele-health approach) may allow teachers to access more coaching support, by removing the need for coaches to travel to and from the preschools and thus it may be valuable for future studies to explore the use of such programmes.

Summary and Conclusion

Numerous studies have documented improved outcomes for young children with ASD who receive effective EI (e.g. Debodinance et al., 2017; Eldevik et al., 2009; Reichow, 2012; Vismara & Rogers, 2010; Warren et al., 2011) and the importance of EI for young children with ASD is now widely acknowledged. There appear to be benefits associated with preschool-based delivery of EI and a number of studies suggest that intervention can be effectively delivered in this context (Tupou et al., 2019). However, these studies often utilise resources that are not available to typical preschools in some communities, so it is unclear whether EI can be feasibly and effectively delivered in these real-world preschools. The studies in the present thesis therefore sought to evaluate the feasibility and effectiveness of the ESDM, a promising EI model, in a real-world preschool setting. Specifically, in Study 1 three young children with ASD received 3-hours per week of intervention delivered by an outside therapist in their regular preschool environment. All children showed improvement on at least 2 of the 3 dependent variables and improvements were generally maintained at follow-up. In Study 2, three regular preschool teachers participated in an 11-week coaching programme where they each received 1 hour per week of coaching to support them in using the ESDM with a young child with ASD at their preschool. Findings showed that teachers improved in their use of the ESDM strategies and all three children showed improvement in AP. Two children improved in their use of IVs and improvements in imitation were only minimal for all children. Positive results were generally maintained over the 11-week follow-up period. Teachers also rated the intervention as acceptable and effective.

Collectively, the results of the studies in this thesis tentatively suggest that the ESDM can be effectively used within the constraints of a typical inclusive preschool setting. Further, the use of the ESDM in inclusive preschools may lead to improvement on some outcomes for young children with ASD and their teachers. However, Studies 1 and 2 are limited in several ways and further research is needed to strengthen and add to these findings.

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APPENDIX A

ETHICAL APPROVAL

Health and Disability Ethics Committees
Ministry of Health
133 Molesworth Street
PO Box 5013
Wellington

6011

0800 4 ETHICS hdecs@moh.govt.nz

09 March 2018

Mrs Jessica Tupou
39 Rawhiti Steet
Lower Hutt 5019

Dear Mrs Tupou

Re:	**Ethics ref:**	**18/CEN/29**
	Study title:	Evaluation of an Inclusive Preschool-Based Approach to Early Intervention for Children with Autism Based on the Early Start Denver Model

I am pleased to advise that this application has been *approved* by the Central Health and Disability Ethics Committee. This decision was made through the HDEC-Full Review pathway.

Summary of Study

The study is an evaluation of an inclusive preschool-based approach to early intervention for children with autism based on the Early Start Denver Model (EDSM). The first study in this proposal involves an intervention delivered to children by an individual trained in EDSM.
The Second involves training teachers to use EDSM strategies with children in their classes.

Summary of ethical issues (resolved)

The main ethical issues considered by the Committee and addressed by the Researcher are as follows.

The Committee noted that Māori consultation had been completed for this study.
The Committee queried how participants would be identified. The Researcher explained that they have approached a kindergarten association of 19 preschools and each of these schools has around 1 student with a diagnosis of autism spectrum disorder.
The Committee asked how the results would be analysed and assessed. The Researcher explained that an independent observer will view videos and transcripts

and check for agreement. The independent observer is another student with expertise in the EDSM.

The Committee requested the following changes to the Participant Information Sheet and Consent Form:

Explain what EDSM is and what the coordinating investigator and teachers will be doing. This includes a brief explanation of procedures and techniques.
Please amend the non-participating child information sheets to state that the CI/teachers may be working with a young child in your child's kindergarten. It is important that information about the participant's diagnosis is not disclosed.
Remove the statement about anticipating improvement in the child's behaviours as this leading.
Remove the statement about affecting their learning or ability to improve.
Explain to teachers in their information sheet that participation will qualify for CME points.

Conditions of HDEC approval

HDEC approval for this study is subject to the following conditions being met prior to the commencement of the study in New Zealand. It is your responsibility, and that of the study's sponsor, to ensure that these conditions are met. No further review by the Central Health and Disability Ethics Committee is required.

Standard conditions:

Before the study commences at *any* locality in New Zealand, all relevant regulatory approvals must be obtained.

Before the study commences at *any* locality in New Zealand, it must be registered in a clinical trials registry. This should be a WHO-approved (such as the Australia New Zealand Clinical Trials Registry, www.anzctr.org.au). However https://clinicaltrials.gov/ is acceptable provided registration occurs prior to the study commencing at *any* locality in New Zealand.

Before the study commences at *a given* locality in New Zealand, it must be authorised by that locality in Online Forms. Locality authorisation confirms that the locality is suitable for the safe and effective conduct of the study, and that local research governance issues have been addressed.

Non-standard conditions:

- Please amend the information sheet and consent form, taking into account the suggestions made by the Committee (*Ethical Guidelines for Intervention Studies para 6.22*).

Non-standard conditions must be completed before commencing your study. Nonstandard conditions do not need to be submitted to or reviewed by HDEC before commencing your study.

If you would like an acknowledgement of completion of your non-standard conditions letter you may submit a post approval form amendment. Please clearly identify in the amendment that the changes relate to non-standard conditions and ensure that supporting documents (if requested) are tracked/highlighted with changes.

For information on non-standard conditions please see section 128 and 129 of the Standard Operating Procedures at http://ethics.health.govt.nz/home.

After HDEC review

Please refer to the *Standard Operating Procedures for Health and Disability Ethics Committees* (available on www.ethics.health.govt.nz) for HDEC requirements relating to amendments and other post-approval processes.

Your next progress report is due by 8 March 2019.

The Central Health and Disability Ethics Committee is satisfied that your study is not a clinical trial that is to be conducted principally for the benefit of the manufacturer or distributor of the medicine or item being trialled. Participants injured as a result of treatment received as part of your study may therefore be eligible for publicly-funded compensation through the Accident Compensation Corporation (ACC).

Please don't hesitate to contact the HDEC secretariat for further information. We wish you all the best for your study.

Yours sincerely,

Mrs Helen Walker
Chairperson
Central Health and Disability Ethics Committee

APPENDIX B

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Confirmation of copyright transfer for “Preschool Interventions for Children with Autism Spectrum Disorder: A Review of Effectiveness Studies” received via email 10.04.2019

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APPENDIX C

PARTICIPANT INFORMATION AND CONSENT FORMS

Teacher Information Sheet

Non-participating teacher – Study 1

Study title: *Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*

Locality: Lower Hutt, NZ

Ethics committee ref.:

Lead investigator:
Jessica Tupou

Contact phone number:
0221271558

A study on the use of ESDM in an inclusive preschool setting will be taking place in the kindergarten where you work. You will not be directly involved, but there is a chance that you may be included in video recordings that will be taken at kindergarten as part of the research. Whether or not you are included in these videos is your choice. If you don't want to be videoed, you don't have to give a reason, and it won't affect your relationship with the researcher or with Victoria University. If you do agree now, but change your mind later, you can withdraw at any time.

This Participant Information Sheet will help you decide if you're happy to be videoed. It sets out why we are doing the study, what it will involve for you, what the benefits and risks might be, and what will happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not to agree to be included in video recordings. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to be included in video recordings taken as part this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend

inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM, in this type of setting. The results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

During this research project I will be working with a young child with autism at the kindergarten where you work for approximately 3 hours per week, using ESDM techniques to teach specific skills and behaviours. I will take weekly 10-minute video recordings of this child playing at kindergarten or working with me. These recordings will take place weekly three to five weeks before intervention, each week during intervention, and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes.

Although these video recordings will be focussed on the participating child, there is a possibility that you may be included in one or more of the videos. This may happen if you are also participating in the same activity or working nearby when a video is being recorded. If you agree to participate, you may be included in one or more of the videos. If you do not agree to participate, I will work to ensure that you are not included in any video recording. In the event that you enter an activity while filming is taking place, filming will be stopped and any footage of you will be immediately deleted.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each kindergarten will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

It is unlikely that you will experience any discomfort or inconvenience because of this research.

We anticipate that this project will help us to better understand how early interventions such as the ESDM can be used to help young children with autism in inclusive preschool settings.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study.

You will not receive any payment or other forms of reimbursement through your child's participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- withdraw from the study any time;
- ask any questions about the study at any time;
- access any information collected about you as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent to participate or withdraw from the study, this will not affect your relationship with the researcher or with Victoria University.

This research is confidential. I will not name you or include any images or other information that would identify you personally in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

If you change your mind and withdraw partway through the study, all information that you provided will be returned to you or destroyed.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. You may request a copy of any research report by emailing the coordinating investigator (CI) at jessica.tupou@vuw.ac.nz.

All video data will be kept securely on a password protected computer in a locked office and will be destroyed 10 years after the research ends. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer

Larah.vandermeer@vuw.ac.nz

Human Ethics Committee information

This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:

Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.	
I have been given sufficient time to consider whether or not to participate in this study.	
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.	
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.	
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without this affecting my relationship with the researcher or Victoria University.	
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.	
I know who to contact if I have any questions about the study in general.	
I wish to receive a summary of the results from the study.	Yes ☐ No ☐

Declaration by participant:
I hereby provide consent to be included in video recordings taken as part of this study.

Participant's name: _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name: _____

Signature: _____ Date: _____

Parent Information Sheet

Participating child – Study 1

Study title: *Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*

Locality: Lower Hutt, NZ

Ethics committee ref.:

Lead investigator:
Jessica Tupou

Contact phone number:
0221271558

Your child is invited to take part in a study on the use of ESDM in an inclusive preschool setting. Whether or not your child takes part is your choice. If you don't want your child to take part, you don't have to give a reason, and it won't affect their learning or care at kindergarten. If you do want your child to take part now, but change your mind later, you can pull them out of the study at any time.

This Participant Information Sheet will help you decide if you'd like your child to take part. It sets out why we are doing the study, what your child's participation would involve, what the benefits and risks to you and your child might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not your child will participate in this study. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree for your child to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM, in this type of setting. The

results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

Your child has been asked to participate because their kindergarten teacher has identified them as having a diagnosis of autism and has suggested that they may benefit from this intervention.

If you agree to your child participating, I will observe your child at kindergarten and then work with you and your child's teachers to identify some specific behaviours/skills to target using the ESDM intervention. I will then work with your child at their kindergarten, using ESDM techniques to teach these skills/behaviours. Teaching will be incorporated into your child's regular kindergarten activities and routines for approximately three hours per week, for approximately 10 weeks.

Also, before the intervention begins, I will ask you to complete a short demographic questionnaire. This will take approximately 30 minutes to complete, and can be completed at a time and place that is convenient for you. I will also ask your child's teacher to complete the Vineland Adaptive Behaviour Scales, third Edition (VABS-III) to measure your child's adaptive behaviour. The VABS-III assessment will also be repeated after the intervention has finished.

In addition to these pre- and post-assessments, once a week I will video record a 10-minute session of your child playing at kindergarten or working with me. These recordings will take place weekly three to five weeks before intervention, each week during intervention, and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each child will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw your child from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

You may experience some inconvenience because of your child's participation in this study. You will be asked to complete a written demographic survey before the study, which will take approximately 30 minutes to complete. To make the process as convenient as possible for you, you can complete this survey at a time and place that suits you.

Your child is unlikely to experience any discomfort as a result of this experiment because the ESDM intervention has been designed to be fun and responsive to a child's needs and interests. As part of the ESDM training process, adults learn to recognize and respond to a child's cues to ensure that the child remains happy and engaged during the ESDM session. If at any time your child shows any signs of discomfort or anxiety during this study, the researcher will immediately stop the research activity and reassure your child.
We anticipate that your child will show improvements in the behaviours/skills that are focused on during this study. The researcher will also offer to explain and demonstrate the ESDM strategies used to teach your child these behaviours/skills so that you are able to learn to use them with your child at home.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study. Your child will receive the ESDM intervention free of charge.

You will not receive any payment or other forms of reimbursement through your child's participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to allow your child to participate, you have the right to:

- withdraw your child from the study any time;
- ask any questions about the study at any time;
- access any information collected about your child as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent for your child to participate or withdraw your child from the study, this will not affect you or your child's relationship with Hutt City Kindergartens or your child's education at kindergarten.

This research is confidential. I will not name your child or include any images or other information that would identify them in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

After the study, your child will no longer receive ESDM intervention from the researcher. However, your child's regular kindergarten teachers will be offered training on the use of ESDM at kindergarten, so that they can continue to use ESDM with your child.

If you change your mind and withdraw your child partway through the study, all information that your child provided will be returned to you or destroyed. If you withdraw your child from the study before the intervention begins, your child will not receive the intervention. If you withdraw your child from the study when they have already started to receive the intervention, they will be able to continue to receive the intervention for the full 10-week period, if you wish.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. After the study you will be provided with a brief summary of the research findings, it is anticipated that this will be provided to you by the end of November 2019. You may also request a copy of any research report by emailing the coordinating investigator (CI) at Jessica.Tupou@vuw.ac.nz.

All information, including paper-based, electronic, and video data, will be kept securely in a locked office at Victoria University and will be destroyed 10 years after the research ends. All paper-based data will be shredded and all electronic and video data will be permanently deleted. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer
Larah.vandermeer@vuw.ac.nz

Health and disability advocate information

If you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:

Phone: *0800 555 050*
Fax: *0800 2 SUPPORT (0800 2787 7678)*
Email: *advocacy@hdc.org.nz*

Maori cultural support information

If you would like Maori cultural support in relation to this research, you can contact _____ on _____

Name, position
Telephone number
Email

Human Ethics Committee information

This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:

Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.
I have been given sufficient time to consider whether or not to allow my child to participate in this study.
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.
I understand that taking part in this study is voluntary (my choice) and that I may withdraw my child from the study at any time without this affecting my child's learning or ability to attend kindergarten.
I consent to the research staff collecting and processing my child's information, including demographic information, assessment results and video recordings.

I understand that my child's participation in this study is confidential and that no material, which could identify them personally, will be used in any reports on this study.		
I know who to contact if I have any questions about the study in general.		
I understand my child's responsibilities as a study participant.		
I wish to receive a summary of the results from the study.	Yes ☐	No ☐

Declaration by participant:
I hereby provide consent for my child to take part in this study.

Child's name:

Parent's name:

Signature: Date:

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name:

Signature: Date:

Parent Information Sheet

Non-participating child – Study 1

Study title: *Early Start Denver Model (ESDM) in an Inclusive Preschoo*

Locality: Lower Hutt, NZ

Ethics committee ref.:

Lead investigator:
Jessica Tupou

Contact phone number:
0221271558

A study on the use of ESDM in an inclusive preschool setting will be taking place in your child's kindergarten. Your child will not be directly involved, but there is a chance that they may be included in video recordings that will be taken at kindergarten as part of the research. Whether or not your child is included in these videos is your choice. If you don't want your child to be videoed, you don't have to give a reason, and it won't affect your child's learning at kindergarten. If you do agree now, but change your mind later, you can withdraw your permission at any time.

This Participant Information Sheet will help you decide if you're happy for your child to be videoed. It sets out why we are doing the study, what it will involve for your child, what the benefits and risks to your child might be, and what will happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not to allow your child to be included in video recordings. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to your child being included in video recordings taken as part this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM, in this type of setting. The results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

During this research project I will be working with a young child with autism at your child's kindergarten for approximately 3 hours per week, using ESDM techniques to teach specific skills and behaviours. I will take weekly 10-minute video recordings of this child playing at kindergarten or working with me. These recordings will take place weekly three to five weeks before intervention, each week during intervention, and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes.

Although these video recordings will be focussed on the participating child, there is a possibility that your child may be included in one or more of the videos. This may happen if your child is participating in the same activity or playing nearby when a video is being recorded. If you agree to your child participating, they may be included in one or more of the videos. If you do not agree to your child participating, I will work to ensure that your child is not included in any video recording. In the event that your child enters an activity while filming is taking place, filming will be stopped and any footage of your child will be immediately deleted.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each kindergarten will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw your child from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

It is unlikely that you or your child will experience any discomfort or inconvenience because of this research.

We anticipate that this project will help us to better understand how early interventions such as the ESDM can be used to help young children with autism in inclusive preschool settings.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study.

You will not receive any payment or other forms of reimbursement through your child's participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to allow your child to participate, you have the right to:

- withdraw your child from the study any time;
- ask any questions about the study at any time;
- access any information collected about your child as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent for your child to participate or withdraw your child from the study, this will not affect you or your child's relationship with Hutt City Kindergartens or your child's education at kindergarten.

This research is confidential. I will not name your child or include any images or other information that would identify them in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

If you change your mind and withdraw your child partway through the study, all information that your child provided will be returned to you or destroyed.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. You may request a copy of any research report by emailing the coordinating investigator (CI) at jessica.tupou@vuw.ac.nz.

All video data will be kept securely on a password protected computer in a locked office and will be destroyed 10 years after the research ends. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer
Larah.vandermeer@vuw.ac.nz

Human Ethics Committee information
This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:
Phone: *0800 4 ETHICS*

Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.	
I have been given sufficient time to consider whether or not to allow my child to participate in this study.	
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.	
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.	
I understand that taking part in this study is voluntary (my choice) and that I may withdraw my child from the study at any time without this affecting my child's learning or ability to attend kindergarten.	
I understand that my child's participation in this study is confidential and that no material, which could identify my child, will be used in any reports on this study.	
I know who to contact if I have any questions about the study in general.	
I wish to receive a summary of the results from the study.	Yes ☐ No ☐

Declaration by participant:
I hereby provide consent for my child to be included in video recordings taken as part of this study.

Child's name: _____

Parent's name: _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name: _____

Signature: _____ Date: _____

Teacher Information Sheet

Non-participating teacher – Study 2

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI VICTORIA UNIVERSITY OF WELLINGTON

Study title: *Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*

Locality: Lower Hutt, NZ

Ethics committee ref.:

Lead investigator:
Jessica Tupou

Contact phone number:
0221271558

A study on the use of ESDM in an inclusive preschool setting will be taking place in the kindergarten where you work. You will not be directly involved, but there is a chance that you may be included in video recordings that will be taken at kindergarten as part of the research. Whether or not you are included in these videos is your choice. If you don't want to be videoed, you don't have to give a reason, and it won't affect your relationship with the researcher or with Victoria University. If you do agree now, but change your mind later, you can withdraw at any time.

This Participant Information Sheet will help you decide if you're happy to be videoed. It sets out why we are doing the study, what it will involve for you, what the benefits and risks might be, and what will happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not to agree to be included in video recordings. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to be included in video recordings taken as part this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM,

in this type of setting. The results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

During this research project I will be working with a teacher from the kindergarten where you work, training them to use ESDM techniques to teach specific skills and behaviours to a young child with autism who attends the kindergarten. As part of the research process, I will be taking weekly 10-minute video recordings of this child playing at kindergarten or working with the teacher. These recordings will take place weekly three to five weeks before intervention, each week during intervention, and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes.

Although these video recordings will be focussed on the participating child, there is a possibility that you may be included in one or more of the videos. This may happen if you are also participating in the same activity or working nearby when a video is being recorded. If you agree to participate, you may be included in one or more of the videos. If you do not agree to participate, I will work to ensure that you are not included in any video recording. In the event that you enter an activity while filming is taking place, filming will be stopped and any footage of you will be immediately deleted.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each kindergarten will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

It is unlikely that you will experience any discomfort or inconvenience because of this research.

We anticipate that this project will help us to better understand how early interventions such as the ESDM can be used to help young children with autism in inclusive preschool settings.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study.

You will not receive any payment or other forms of reimbursement through your child's participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- withdraw from the study any time;
- ask any questions about the study at any time;
- access any information collected about you as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent to participate or withdraw from the study, this will not affect your relationship with the researcher or with Victoria University.

This research is confidential. I will not name you or include any images or other information that would identify you personally in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

If you change your mind and withdraw partway through the study, all information that you provided will be returned to you or destroyed.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. You may request a copy of any research report by emailing the coordinating investigator (CI) at jessica.tupou@vuw.ac.nz.

All video data will be kept securely on a password protected computer in a locked office and will be destroyed 10 years after the research ends. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer
Larah.vandermeer@vuw.ac.nz

Human Ethics Committee information

This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:

Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.		
I have been given sufficient time to consider whether or not to participate in this study.		
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.		
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.		
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without this affecting my relationship with the researcher or Victoria University.		
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I know who to contact if I have any questions about the study in general.		
I wish to receive a summary of the results from the study.	Yes ☐	No ☐

Declaration by participant:
I hereby provide consent to be included in video recordings taken as part of this study.

Participant's name: _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name: _____

Signature: _____ Date: _____

Participant Information Sheet

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI VICTORIA UNIVERSITY OF WELLINGTON

Study title:	*Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*
Locality: Lower Hutt, NZ	Ethics committee ref.:
Lead investigator: Jessica Tupou	Contact phone number: 0221271558

You are invited to take part in a study on the use of ESDM in an inclusive preschool setting. Whether or not you take part is your choice. If you don't want to take part, you don't have to give a reason, and it won't affect the care you receive. If you do want to take part now, but change your mind later, you can pull out of the study at any time.

This Participant Information Sheet will help you decide if you'd like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not you will participate in this study. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM, in this type of setting. The results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

You have been asked to participate because a child with a diagnosis of autism, who may benefit from this intervention, attends the kindergarten where you teach. You have also indicated that you are interested in taking part in the ESDM training programme.

If you agree to participate, I will observe the participating child at your kindergarten and then work with you and the child's whānau to identify some specific behaviours/skills to target using the ESDM intervention. You will then complete a brief ESDM training programme which will involve eleven 60-minute in vivo coaching sessions. I will guide you through the coaching sessions at your kindergarten. During these sessions, I will provide written material on each of the ESDM techniques then give you an opportunity to practice the technique with the participating child and receive in vivo coaching and feedback.

Following coaching, you will work with the participating child at your kindergarten, using ESDM techniques to teach the identified skills/behaviours. Teaching will be incorporated into regular kindergarten activities and routines.

Also, before the intervention begins, I will meet with you to complete the Vineland Adaptive Behaviour Scales, third Edition (VABS-III) to measure the participating child's adaptive behaviour. I will also ask you to complete a short demographic questionnaire. The VABS-III assessment will take approximately one hour to complete and the demographic questionnaire will take approximately 30 minutes, these can be completed at a time and place that is convenient for you. The VABS-III assessment will also be repeated after the intervention has finished.

In addition to these pre- and post-assessments, once a week I will video record a 10-minute session of the participating child playing at kindergarten or working with you. These recordings will take place weekly three to five weeks before intervention, each week during intervention (approximately 10 weeks), and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes. During the intervention, after collecting each video recording, I will provide you with feedback on your use of ESDM techniques during that session. I will also ask you to share your thoughts on your performance and the participating child's learning during the preceding week.

Finally, as part of the post-assessment process, I will conduct an in-depth interview with you at a time and place that is convenient for you. This interview will take approximately one hour. During the interview I will ask you questions about your perceptions of the ESDM training programme and intervention as well as how both the training and intervention could be improved. We will also be able to discuss anything else related to the training or intervention that you would like to talk about. The interview will be audio-recorded and later transcribed and summarised. I will provide you with a written summary of your interview to check and ask you to check that I have accurately recorded your thoughts and ideas. You

may also request a written transcript of the interview by emailing me as Jessica.Tupou@vuw.ac.nz.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each kindergarten will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

You may experience some inconvenience because of your participation in this study. You will be asked to complete several written surveys/questionnaires before the study and to repeat one of the questionnaires again at the end of the research, altogether it will take approximately two and a half hours to complete this process. You will also be required to spend approximately seven hours completing the ESDM training programme. Finally, you will be asked to participate in an in-depth interview, this will take approximately one hour. To make the research process as convenient as possible for you, pre-assessment measures, the online training module and the interview can be completed at a time and place that suits you.

We anticipate that the participating child will show improvements in the behaviours/skills that are focused on during this study. It is also anticipated that your skills and confidence in the use of ESDM strategies will improve through your participation in this study.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study. You will receive the ESDM training free of charge.

You will not receive any payment or other forms of reimbursement through your participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- withdraw from the study any time;
- ask any questions about the study at any time;
- access any information collected about you as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent to participate or withdraw from the study, this will not affect your relationship with Victoria University.

This research is confidential. I will not name you or include any images or other information that would identify you personally in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

After the study, you will no longer receive weekly ESDM support from the researcher, however you will be able to contact the researcher for follow-up support if needed.

If you change your mind and withdraw partway through the study, all information that you have provided will be returned to you or destroyed. If you withdraw from the study before the ESDM training begins, you will not receive the training. If you withdraw from the study when you have already started the training programme, you will be able to continue to receive the full training package, if you wish.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. After the study you will be provided with a brief summary of the research findings, it is anticipated that this will be provided to you by the end of November 2019. You may also request a copy of any research report by emailing the coordinating investigator (CI) at Jessica.Tupou@vuw.ac.nz.

All information, including paper-based, electronic, and video data, will be kept securely in a locked office at Victoria University and will be destroyed 10 years after the research ends. All paper-based data will be shredded and all electronic and video data will be permanently deleted. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer
Larah.vandermeer@vuw.ac.nz

Maori cultural support information

If you would like Maori cultural support in relation to this research, you can contact _____ on _____

Name, position
Telephone number
Email

Human Ethics Committee information

This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:

Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.
I have been given sufficient time to consider whether or not to participate in this study.
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without this affecting my relationship with Victoria University.
I consent to the research staff collecting and processing my information, including demographic information, video recordings of my teaching and audio recordings of any interviews.

I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.	
I know who to contact if I have any questions about the study in general.	
I understand my responsibilities as a study participant.	
I wish to receive a summary of the results from the study.	Yes ☐ No ☐

Declaration by participant:
I hereby provide consent to take part in this study.

Participant's name: _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name: _____

Signature: _____ Date: _____

Parent Information Sheet
Participating child – Study 2

Study title: *Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*

Locality: Lower Hutt, NZ

Ethics committee ref.:

Lead investigator:
Jessica Tupou

Contact phone number:
0221271558

Your child is invited to take part in a study on the use of ESDM in an inclusive preschool setting. Whether or not your child takes part is your choice. If you don't want your child to take part, you don't have to give a reason, and it won't affect their learning or care at kindergarten. If you do want your child to take part now, but change your mind later, you can pull them out of the study at any time.

This Participant Information Sheet will help you decide if you'd like your child to take part. It sets out why we are doing the study, what your child's participation would involve, what the benefits and risks to you and your child might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not your child will participate in this study. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree for your child to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 6 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

WHAT IS THE PURPOSE OF THE STUDY?

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. This study will be used for my PhD thesis.

The ESDM is a promising early intervention for young children with autism, it has been shown to be effective when delivered one-on-one and in specialist autism preschools. The aim of this project is to evaluate the effectiveness of the ESDM in an inclusive NZ preschool setting. This is important because In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention, such as the ESDM, in this type of setting. The results of this study will help us to better understand whether it is feasible and effective to deliver ESDM in this type of setting.

This study has received ethical approval from the Central Health and Disability Ethics Committee (approval no. _____).

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

Your child has been asked to participate because their kindergarten teacher has identified them as having a diagnosis of autism and suggested that they may benefit from this intervention.

If you agree to your child participating, I will observe your child at kindergarten and then work with you and your child's teachers to identify some specific behaviours/skills to target using the ESDM intervention. Your child's kindergarten teacher will then be trained to use ESDM strategies to teach your child these skills/behaviours. The teacher will incorporate ESDM teaching into your child's regular kindergarten activities and routines.

Also, before the intervention begins, I will ask you to complete a short demographic questionnaire. This will take approximately 30 minutes to complete, and can be completed at a time and place that is convenient for you. I will also ask your child's teacher to complete the Vineland Adaptive Behaviour Scales, third Edition (VABS-III) to measure your child's adaptive behaviour. The VABS-III assessment will also be repeated after the intervention has finished.

In addition to these pre- and post-assessments, once a week I will video record a 10-minute session of your child playing at kindergarten or working with their teacher. These recordings will take place weekly three to five weeks before intervention, each week during intervention (approximately 10 weeks), and several weeks afterwards. The videos will be viewed by the research team only and will only be used for research purposes.

I anticipate that this research will commence early 2018 and will continue until mid- 2019. My involvement with each child will last approximately 4 to 6 months, which includes the time for pre-assessment, intervention (10 weeks) and follow-up.

You are free to withdraw your child from the project at any time. You can let me know by speaking to me or emailing me at jessica.tupou@vuw.ac.nz and telling me that you wish to withdraw. If your child withdraws, the information they provided will be destroyed or returned to you.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?

You may experience some inconvenience because of your child's participation in this study. You will be asked to complete a written demographic survey before the study, which will take approximately 30 minutes to complete. To make the process as convenient as possible for you, you can complete this survey at a time and place that suits you.

Your child is unlikely to experience any discomfort as a result of this experiment because the ESDM intervention has been designed to be fun and responsive to a child's needs and interests. As part of the ESDM training process, your child's teacher will learn to recognize

and respond to your child's cues to ensure that the child remains happy and engaged during the ESDM session. If at any time your child shows any signs of discomfort or anxiety during this study, the researcher will immediately stop the research activity and reassure your child. We anticipate that your child will show improvements in the behaviours/skills that are focused on during this study. The researcher will also offer to explain and demonstrate the ESDM strategies used to teach your child these behaviours/skills so that you are able to learn to use them with your child at home.

WHO PAYS FOR THE STUDY?

You will not be expected to pay anything in relation to this study. Your child will receive the ESDM intervention free of charge.

You will not receive any payment or other forms of reimbursement through your child's participation in this study.

WHAT ARE MY RIGHTS?

You do not have to accept this invitation if you don't want to. If you do decide to allow your child to participate, you have the right to:

- withdraw your child from the study any time;
- ask any questions about the study at any time;
- access any information collected about your child as part of this study;
- view any reports of this research by emailing the researcher to request a copy.

If you choose not to provide consent for your child to participate or withdraw your child from the study, this will not affect you or your child's relationship with Hutt City Kindergartens or your child's education at kindergarten.

This research is confidential. I will not name your child or include any images or other information that would identify them in any reports. All material collected will be kept confidential to myself, my supervisors and a colleague who will be asked to check some of the data as a reliability measure. This colleague will be required to sign a confidentiality agreement before accessing any data. Video data will only be used for the purposes of data analysis for this current study. It will not be shown to anyone other than the researchers and will not be used in any presentations or workshops.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

After the study, your child's regular kindergarten teacher may continue to use ESDM with your child.

If you change your mind and withdraw your child partway through the study, all information that your child provided will be returned to you or destroyed. If you withdraw your child from

the study before the intervention begins, your child will not receive the intervention. If you withdraw your child from the study when they have already started to receive the intervention, your child's kindergarten teacher may continue to use ESDM with your child, if you wish.

The information from this research will be used in my PhD thesis. I may also use the results of my research for conference presentations, and academic reports. After the study you will be provided with a brief summary of the research findings, it is anticipated that this will be provided to you by the end of November 2019. You may also request a copy of any research report by emailing the coordinating investigator (CI) at jessica.tupou@vuw.ac.nz.

All information, including paper-based, electronic, and video data, will be kept securely in a locked office at Victoria University and will be destroyed 10 years after the research ends. All paper-based data will be shredded and all electronic and video data will be permanently deleted. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Student:
Jessica Tupou
jessica.tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Larah van der Meer
Larah.vandermeer@vuw.ac.nz

Health and disability advocate information
If you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:
Phone: *0800 555 050*
Fax: *0800 2 SUPPORT (0800 2787 7678)*
Email: *advocacy@hdc.org.nz*

Maori cultural support information
If you would like Maori cultural support in relation to this research, you can contact _____ on _____

Name, position
Telephone number
Email

Human Ethics Committee information

This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:

Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

Consent Form

Please tick to indicate you consent to the following:

I have read, or have had read to me in my first language, and I understand the Participant Information Sheet.	
I have been given sufficient time to consider whether or not to participate in this study.	
I have had the opportunity to use a legal representative, whanau/ family support or a friend to help me ask questions and understand the study.	
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.	
I understand that taking part in this study is voluntary (my choice) and that I may withdraw my child from the study at any time without this affecting my child's learning or ability to attend kindergarten.	
I consent to the research staff collecting and processing my child's information, including demographic information, assessment results and video recordings.	
I understand that my child's participation in this study is confidential and that no material, which could identify them personally, will be used in any reports on this study.	
I know who to contact if I have any questions about the study in general.	
I understand my child's responsibilities as a study participant.	
I wish to receive a summary of the results from the study.	Yes ☐ No ☐

Declaration by participant:
I hereby provide consent for my child to take part in this study.

Child's name: _____

Parent's name: _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name: _____

Signature: _____ Date: _____

Parent Information Sheet

Non-participating child – Study 2

Study title:	*Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.*

Lead investigator:	**Contact phone number:**	**Ethics committee ref.:**
Jessica Tupou	0221271558	18/CEN/29

My name is Jessica Tupou and I am a PhD student from Victoria University of Wellington. As part of my PhD I will be doing some research at your child's kindergarten. This information sheet explains why I am doing this research and what it will involve for your child. Please read this information carefully and contact me if there is anything that is not clear or if you would like more information.

WHAT IS THIS STUDY ABOUT?

In New Zealand, many children with autism attend inclusive preschools, so it may be practical to deliver early intervention for autism in this type of setting. I am trying to find out whether it is effective for teachers to deliver a play-based early intervention called the Early Start Denver Model (ESDM) in a kindergarten setting.

During this research project I will be working with a teacher from your child's kindergarten, training them to use the ESDM to teach specific skills and behaviours to one of the children who attends kindergarten (this will not be your child). As part of the research process, I will be taking weekly 10-minute video recordings of this child playing at kindergarten or working with the teacher.

HOW WILL MY CHILD BE INVOLVED?

Your child will not be directly involved, but there is a chance that they may be included in the video recordings. This may happen if your child is participating in the same activity or playing nearby when a video is being recorded. If you do not agree to your child being included in the videos, I will try to ensure that your child is not videoed, if your child enters an activity while filming is taking place, filming will be stopped and any footage of your child will be immediately deleted.

Whether or not your child is included in these videos is your choice. If you don't want your child to be videoed, you don't have to give a reason, and it won't affect your child's learning at kindergarten.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

The videos will be viewed by the research team only and will only be used for research purposes. All video data will be kept securely on a password protected computer in a

locked office and will be destroyed 10 years after the research ends. The CI will take responsibility for the storage and destruction of all data.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you would like more information or have any problems with this research, please let me know. You can contact me or one of my supervisors at the following address:

Student:
Jessica Tupou
Jessica.Tupou@vuw.ac.nz

Supervisors:
Dr Jeff Sigafoos
jeff.sigafoos@vuw.ac.nz

Dr Hannah Waddington
Hannah.Waddington@vuw.ac.nz

Human Ethics Committee information
This research has been approved by the Central Health and Disability Ethics Committee (HDEC). If you have any concerns about the ethical conduct of the research you may contact the HDEC:
Phone: *0800 4 ETHICS*
Email: *hdecs@moh.govt.nz*

WHAT DO I DO NEXT?

If you are happy for your child to be involved in my research you do not need to do anything. Please keep this information for reference.

If you **do not** want your child to be involved in this research, please complete the attached form and return it to your child's kindergarten teacher.

CAN YOU CHANGE YOUR MIND?

You and your child have the right to withdraw from the research at any time.

Thank you very much for your time.

PARENT OPT-OUT FORM

Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.

Please complete this form and return it to your child's kindergarten teacher if you **DO NOT** wish for your child to be involved in the study.

I have read the information about the study.

I am not willing for my child to take part in the study. *Please tick the box below.*

☐

Child's name: _____

Parent's name: _____

Signature: _____ Date: _____

APPENDIX D

PARENT DEMOGRAPHIC SURVEY

Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.

Parent Demographic Survey

Name of child: _____

Child's DOB: _____

Child's age at diagnosis: _____

Diagnosis made by (please circle one): Local hospital (Child Development Team)

Private practitioner

Other

Child's ethnicity: _____

Please list any ASD services that your child is currently receiving:

_____

_____

_____

Please list any ASD services that your child has received in the past:

_____

_____

APPENDIX E

MODIFIED ESDM FIDELITY SCALE

1. Management of attention - Adult waited until child was attending to them before delivering cues. - Adult managed the environment to minimise distractions *(e.g. cleared away toys if they distracted from learning or engagement, did not bring out too many materials at once)* - Adult positioned themselves face-to-face with the child, at the child's eye-level and attracted the child's attention to their face by holding items near the face.		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
2. ABC Format -Teaching opportunities occurred: -Adult delivered clear antecedents *(cues are obvious and not repeated- do not code for attending)* -Adult immediately reinforced correct behaviours and attempts		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
3. Instructional techniques Adult used prompting/fading/chaining to minimise child errors and increase independent use of new skills When prompting was used, a least-to-most hierarchy was followed (*Verbal and gestural before physical, follow through on antecedents):*	N/A	☐Never (0) ☐Rarely (2) ☐Sometimes (4) ☐Usually (6) ☐Con. (8) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
4. Affect and Arousal Adult managed child problems with affect and arousal (e.g. child too excited, too high energy, or bored/low energy) to maximise the child's participation in learning activities *(score full marks if no problems with affect/arousal)*		☐Never (0) ☐Rarely (3) ☐Sometimes (6) ☐Usually (9) ☐Con. (12)
5. Management of unwanted behaviours Adult used positive techniques to manage unwanted behaviours (e.g. crying, screaming, aggression, property destruction) and redirect the child, elicit a more positive behaviour and re-establish engagement and positive affect *(score full marks if no unwanted behaviours)*		☐Never (0) ☐Rarely (3) ☐Sometimes (6) ☐Usually (9) ☐Con. (12)
6. Dyadic engagement - Both partners (child and therapist) took turns leading and following. - Adult provided opportunities for the child to be actively involved in turn taking (e.g. giving/requesting materials, cuing adult turns and providing play ideas). - Adult and child engaged in reciprocal social exchanges (e.g. shared gaze, directed intentional communicative exchanges and/or smiles).		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
7. Motivation -Adult gave the child opportunities to choose (by providing explicit choices and following child choices in play). - The child showed interest in the activity for the duration of the activity.		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)

-There were a mix of maintenance and acquisition tasks (acquisition tasks should require prompting and support from the adult).		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
8. Positive Affect The adult had rich genuine positive affect which was matched by child positive affect (if adult showed positive affect but it was not matched by child positive affect, score "Usually").		☐Never (0) ☐Rarely (3) ☐Sometimes (6) ☐Usually (9) ☐Con. (12)
9. Sensitivity and responsivity - Adult responded to child communications (both directed and undirected) - The adult used restatement, modelling, expansion and affirmation to respond to child communications. - The adult understood child communications (undirected and directed) or demonstrated an effort to interpret the child's meaning.		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
10. Multiple and varied communication - The adult provided opportunities for the child to communicate - Opportunities were given for: requesting, commenting/naming, protesting, seeking help, finishing, greeting, imitating voice or gesture, asking for information		☐Never (0) ☐Rarely (1.5) ☐Sometimes (3) ☐Usually (4.5) ☐Con. (6) ☐One (0) ☐ Two (1.5) ☐Three (3) ☐Four (4.5) ☐ Five+ (6)
11. Appropriateness of adult language - The adult followed the "one-up rule" to match language to the child's development. (Sometimes= roughly same number of words, Rarely/never=far too many or few) - The adult used appropriate language to describe the child's actions and add sound effects - The adult demonstrated use of a range of different communicative functions including requesting, commenting/naming, protesting, seeking help, finishing, greeting and imitating voice, asking for information		☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐One (0) ☐Two (1) ☐Three (2) ☐Four (3) ☐ Five+(4)
12. Joint activity structure and elaboration Activity had a clear set-up phase *(N/A if set up phase is not included in the video)* Activity included sufficient elaborations Activity had a clear clean up phase *(N/A if clean up phase is not included in the video)*	☐N/A ☐N/A	☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
13. Transition between activities When the child finished an activity, the adult quickly gave him/her a choice of a new one (Sometimes=quick no choice) The child performed physical transitions independently (e.g. walked from the table to the floor without being carried or led).	☐N/A ☐N/A	☐Never (0) ☐Rarely (2) ☐Sometimes (4) ☐Usually (6) ☐Con. (8) ☐Never (0) ☐Rarely (1) ☐Sometimes (2) ☐Usually (3) ☐Con. (4)
Total Score		/156

APPENDIX F

DATA COLLECTION SHEET

0	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
1	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
2	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**

3	0” - 10” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10” – 20” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20” -30” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30” – 40” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40” – 50” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50” – 60” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
4	0” - 10” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10” – 20” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20” -30” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30” – 40” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40” – 50” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50” – 60” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
5	0” - 10” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10” – 20” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20” -30” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30” – 40” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40” – 50” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50” – 60” **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**

6	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
7	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**
8	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**

9	0" - 10" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	10" – 20" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	20" -30" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	30" – 40" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	40" – 50" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	50" – 60" **Active Participation** *Part* □ *Whole* □ *None* □ **Imitation: Y N** **SFU: Y N** **IV: Y N**	**ROW TOTAL:** **AP-part:** **AP-whole:** **Imitation:** **SFU:** **IV:**

Intentional Vocalisations: Total # of intervals with: Total % of intervals with:	**Active Participation:** Total # of PART intervals with: Total % of PART intervals with: Total # of WHOLE intervals with: Total % of WHOLE intervals with:
Spontaneous Functional Utterances: Total # of intervals with: Total % of intervals with:	
Notes:	**Imitation:** Total # of intervals with: Total % of intervals with:

Participant:	Date:
Observer:	

APPENDIX G

PROCEDURAL INTEGRITY CHECKLIST STUDY 1

Procedures	Procedural integrity
1. Session began when child was playing with an objector engaged in an activity	/1
2. Researcher included naturalistic probes of imitation and/or language on average every 30s (-1 for each probe above this number)	/1
3. Researcher responded appropriately to any child attempts to initiate play or interaction	/1
4. No prompting was used and no specific developmental skills were targeted	
5. Session lasted 10 minutes	/1

NB/ if the child exhibited any challenging or dangerous behaviour (e.g. hitting others or throwing materials), the therapist took steps block this behaviour. If the child became distressed or otherwise indicated that they wished to end the session, the therapist ended the session immediately.

APPENDIX H

TEACHER ENTRY SURVEY

Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.

Teacher Demographic Survey – Study 2

1. Name: _____

2. Please select the option below that best describes your level of experience in teaching children with autism:

   ☐ **Low** – *I have no/very little experience in teaching children with autism*

   ☐ **Moderate** – *I have some experience in teaching children with autism*

   ☐ **High** – *I have a lot of experience in teaching children with autism*

3. Please circle the number that best describes your level of agreement with the following statements:

	Strongly Disagree	Disagree	Neither agree/ Disagree	Agree	Strongly Agree
I am confident in my ability to teach children with autism.	1	2	3	4	5
I have the knowledge that I need to be able to teach children with autism.	1	2	3	4	5
I have the skills that I need to be able to teach children with autism.	1	2	3	4	5

APPENDIX I

TARF-R – ADAPTED FOR TEACHERS

TREATMENT ACCEPTABILITY RATING FORM – REVISED (TARF-R) (POST-INTERVENTION)

Please complete the items listed below. The items should be completed by placing a checkmark on the line under the question that best indicates how you feel about the treatment you have been using.

1. **How clear is your understanding of this treatment?**

   _____ _____ _____ _____ _____ _____ _____
   Not at all clear — Neutral — Very clear

2. **How acceptable did you find the treatment to be regarding your concerns about the child you teach?**

   _____ _____ _____ _____ _____ _____ _____
   Not at all acceptable — Neutral — Very acceptable

3. **How willing were you to carry out this treatment?**

   _____ _____ _____ _____ _____ _____ _____
   Not at all willing — Neutral — Very willing

4. **Given the behavioral problems of the child you teach, how reasonable do you find the treatment to be?**

   _____ _____ _____ _____ _____ _____ _____
   Not at all reasonable — Neutral — Very reasonable

5. **How costly was it to carry out this treatment?**

   _____ _____ _____ _____ _____ _____ _____
   Not at all costly — Neutral — Very costly

6. **To what extent do you think there were disadvantages in following this treatment?**

_____	_____	_____	_____	_____	_____	_____
None are likely			Neutral			Many are likely

7. **How likely is this treatment to make permanent improvements in outcomes for the child you teach?**

_____	_____	_____	_____	_____	_____	_____
Unlikely			Neutral			Very likely

8. **How much time was needed each day for you to carry out this treatment?**

_____	_____	_____	_____	_____	_____	_____
Little time was needed			Neutral			Much time was needed

9. **How confident are you that the treatment was effective?**

_____	_____	_____	_____	_____	_____	_____
Not at all confident			Neutral			Very confident

10. **Compared to other children with autism, how serious are the problems of the child you teach?**

_____	_____	_____	_____	_____	_____	_____
Not at all serious			Neutral			Very serious

11. **How disruptive was it to teachers and children (in general) to carry out this treatment?**

_____	_____	_____	_____	_____	_____	_____
Not at all disruptive			Neutral			Very disruptive

12. **How effective was this treatment for the child you teach?**

_____ _____ _____ _____ _____ _____ _____

Not at all effective — Neutral — Very effective

13. How affordable was this treatment?

_____ _____ _____ _____ _____ _____ _____

Not at all affordable — Neutral — Very affordable

14. How much do you like the procedures/strategies used in the treatment?

_____ _____ _____ _____ _____ _____ _____

Do not like them at all — Neutral — Like them very much

15. How willing will other teachers be to help carry out this treatment?

_____ _____ _____ _____ _____ _____ _____

Not at all willing — Neutral — Very willing

16. To what extent are undesirable side-effects likely to result from this treatment?

_____ _____ _____ _____ _____ _____ _____

No side-effects are likely — Neutral — Many side-effects are likely

17. How much discomfort was the child you teach likely to experience during the course of this treatment?

_____ _____ _____ _____ _____ _____ _____

No discomfort at all — Neutral — Very much discomfort

18. How severe are the difficulties of the child you teach?

_____ _____ _____ _____ _____ _____ _____

Not at all severe — Neutral — Very severe

19. How willing would you be to change the usual kindergarten routine to carry out this treatment?

_____ _____ _____ _____ _____ _____ _____

Not at all willing Neutral Very willing

20. How well did carrying out this treatment fit into kindergarten routines?

_____ _____ _____ _____ _____ _____ _____

Not at all Neutral Very well

APPENDIX J

TEACHER EXIT SURVEY

Early Start Denver Model (ESDM) in an Inclusive Preschool Setting.

Teacher Demographic Survey – Study 2

Name: _____

Please circle the number that best describes your level of agreement with the following statements:

	Strongly Disagree	Disagree	Neither agree/ Disagree	Agree	Strongly Agree
I am confident in my ability to teach children with autism.	1	2	3	4	5
I have the knowledge that I need to be able to teach children with autism.	1	2	3	4	5
I have the skills that I need to be able to teach children with autism.	1	2	3	4	5

APPENDIX K

PROCEDURAL INTEGRITY CHECKLIST – STUDY 2 BASELINE & FOLLOW-UP

Procedures	Procedural integrity
1. The teacher was present at the start of filming	/1
2. Researcher did not provide any prompting or feedback to the teacher	/1
3. Researcher did not interact with the child	/1
5. Session lasted 10 minutes	/1

NB/ if the child or teacher spoke to or approached the researcher during the video, the researcher responded politely keeping any interaction to a minimum. If the child became distressed or otherwise indicated that they wished to end the session, the session was ended immediately.

APPENDIX L

PROCEDURAL INTEGRITY – STUDY 2 INTERVENTION

Procedural Integrity Checklist - Intervention:

1. The following elements were present (minus one for each missing element): (a) Greeting and checking-in, (b) Initial play session with child (practicing last week's skill), (c) Teacher reflection on initial play session, (d) Researcher reflection on initial play session, (e) Introduction of new topic for the week, (f) Second play session with child (practicing this week's skill), (g) Teacher reflection on second play session, (h) Researcher reflection on second play session and (i) Closing.	/9
2. Collaborative: (a) Researcher demonstrated active listening (b) Teacher knowledge, skills, values, attitudes and/ or beliefs were acknowledged (c) Researcher and teacher decided upon goals and action plans together	/3
3. Reflective: (a) Researcher shared at least 2 reflections on observed teacher/child behaviour, the link between teacher/child actions and learning objectives, the impact of teacher behaviour on child behaviour and/or observed emotional expressions. (b) Researcher encouraged teacher to make his/her own reflections (c) Reflections were linked to evaluations, action plans, ideas and/or suggestions	/3
4. Non-judgmental: Researcher used descriptive rather than evaluative or judgemental language	/1
5. Conversational & Reciprocal: (a) The interaction between the researcher and the teacher was balanced and conversational (both parties took equal turns listening and speaking). (b) The researcher listened and responded to teacher topics, ideas and/or questions (c) The researcher used a warm, friendly, encouraging tone	/3
6. Session lasted 60-minutes (+/- 10%)	/1
TOTAL:	/20

APPENDIX M

INTERVIEW PROTOCOL

Intervention:

ESDM topics (different topics taught each week e.g. capturing your child's attention, imitation, verbal communication, etc...)

How relevant/useful were the weekly topics to you and the child that you teach?

Which topics did you find to be most relevant/useful?

Which topics were less relevant/useful?

Which topics were not included but would have been useful/relevant to you?

How easy was it to understand the ESDM topics?

Which topics were easy to understand?

Which topics were more difficult to understand?

What suggestions do you have regarding the ESDM topics?

ESDM strategies (positioning face-to-face with the child, following the child's lead, providing choices, using expectant pauses, prompting, imitating child sounds and actions, using the 'one-up rule", etc…)

How effective did you find the ESDM strategies?

Which strategies did you find to be most effective/helpful?

Which strategies were less effective/helpful?

How easy was it to use the ESDM strategies?

Which strategies were easy to use?

Which strategies were more difficult to use?

What planning was required for you to use the strategies in your teaching practice?

What extra resources were required for you to use the strategies in your teaching practice?

How did using the ESDM strategies impact upon your regular teaching practice?

What impact did your use of ESDM strategies have on other members of the teaching team?

What impact did your use of ESDM strategies have on other children at the kindergarten?

What suggestions do you have regarding the ESDM topics strategies?

Coaching:

Coaching elements (weekly handouts with explanation, practice with invivo support and prompting, immediate feedback, weekly goal setting and review, teacher-coach rapport).

Which elements were the most helpful?

Which elements were less helpful?

How did you feel about your relationship with the coach? What could have improved the coaching relationship?

Coaching structure

How suitable was the length of each coaching session?

How suitable was the number of coaching sessions you received?

How did you feel about the order that the topics were presented in?

How did you feel about the length of time spent on each topic?

Which topics would you have liked to spend more time on?

Which topics would you have liked to spend less time on?

What suggestions do you have regarding the coaching elements and/or structure?

Which part of the coaching process did you find the most challenging?

Which part of the coaching process did you find the most rewarding?

Teacher outcomes

What difference, if any, do you think the ESDM coaching has made for you as a teacher? (e.g. confidence, knowledge, skills).

In what areas/skills have you noticed the biggest changes/improvements in your teaching practice?

How relevant do you think these skills will be for working with other children with ASD?

How could your confidence, knowledge and/or skills have been improved/further improved?

Child outcomes

What difference, if any, do you think the ESDM coaching has made for the child that you teach? (e.g. play skills, communication, behaviour, interaction and engagement with others…)

In what areas/skills/behaviours have you seen the biggest changes/improvements?

In what areas/skills/behaviours have you seen less or no improvement?

What side-effects do you think the intervention has had on the child that you teach?

How could the child's outcomes have been improved/further improved?

Do you have anything else to add?

APPENDIX N

TABLE OF INTERVIEW CODES AND SIGNIFICANT STATEMENTS

Corresponding Codes and Examples of Significant Statements for the "Complications associated with using the intervention in a preschool environment." Research Theme.

Theme	Corresponding codes	Example of significant statement
Complications associated with using the intervention in a preschool environment.	• Ratios	Helen: "One of the challenges of providing ESDM within this kind of environment is the fact that you've got 40 other children to support with you know little ratios."
		Kelly: "We don't have that much time for one-on-one because you know we've got ratios of like 1-10."
	• Other children with diverse needs	Bear: "It's much better now (finding time to work with Anaru) because we haven't got as many with special needs, diverse learners, that's what we call them."
		Helen: "Tama is not the only one, we have other children with challenging behaviours or other diverse learning needs that do need a bit more one-on-one and it can be really hard."
	• Physical environment (including free play)	Bear: "The other day he was getting dysregulated, probably because there was too much in that area where the trains were. There were also the blocks and some animals and other things."
		Kelly: "It was hard having to compete with the alphabet things that were available because when you tried to get him interested in other toys, he'd just go back to his old favourites."
	• Challenges with peers	Bear: "When Anaru's ready to move on he'll start throwing things so a lot of it's about keeping the other children safe when they come in and they're working alongside him."
		Helen: "(It's hard) when Tama's still playing and pulling things out and then the other kids are going "hold on a minute, why is he allowed to play and I have to tidy up?"
	• Working as a team	Helen: "The other teacher within would have to cover the whole floor because I was trying to work one-on-one with Tama and if I didn't have someone covering me you know when I was trying to do something, or he was really engaged in something and it was a routine time, it just threw everybody out."