Stockholm University

Early intervention and autism

Improving preschool program quality for children with autism spectrum disorder receiving Early Intensive Behavioral Intervention using the Autism Program Environment Rating Scale (APERS)

Hampus Bejnö

Doctoral Thesis in Special Education at Stockholm University, Sweden 2021

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Academic dissertation for the Degree of Doctor of Philosophy in Special Education at Stockholm University to be publicly defended on Tuesday 30 November 2021 at 10.00 in Lärosal 16, hus 2, Albanovägen 18 and online via Zoom, public link is available at the department website.

Abstract

The quality of the learning environment in preschool is of significant importance for children with autism spectrum disorder (ASD). However, very limited research has addressed how this environment can be improved. In regard to early intervention, most previous studies have primarily focused on child characteristics, and intervention content and quantity, rather than the broader learning environment in which interventions are delivered. Thus, the overall aim of this thesis was to study the quality of the learning environment for children with ASD. In particular, the focus was on children who receive Early Intensive Behavioral Intervention (EIBI) in community-based Swedish preschools, using the Autism Program Environment Rating Scale (APERS). Within this framework, three studies were conducted.

In study 1, we translated, culturally adapted, and systematically assessed the content validity of APERS, a rating scale designed to assess the program quality for children with ASD in educational settings. In the process, the scale was modified to make the instrument as relevant as possible for the Swedish preschool context, and re-named APERS-P-SE. Nine experts rated the clarity and comprehensiveness of the individual items, as well as the relevance of the scale in its entirety. In study 2, we evaluated APERS-P-SE as the foundation for professional development for preschool staff working with children with ASD receiving EIBI, to promote preschool learning environment quality (primary outcome), and outcomes for autistic children, and preschool staff (secondary outcomes). Using a quasi-experimental design, preschool staff either implemented EIBI enriched by in-service training and on-site coaching based on APERS-P-SE assessments ($k = 9$), or EIBI only ($k = 8$) during 8 months. A total of 17 children and 35 preschool staff participated, across 17 preschools. In study 3, individual interviews and focus-group interviews were conducted with preschool staff, preschool principals, habilitation supervisors, and parents to children with ASD who had participated in study 2 and received the APERS-P-SE-based intervention. Through these interviews, the different groups of stakeholders provided their thoughts about what they found to be the most important aspects of preschool programs for autistic children who receive EIBI, and their opinions and experiences of participating in study 2.

Study 1 demonstrated a high level of content validity for the Swedish version of the APERS. In study 2, the EIBI/APERS-P-SE preschools significantly improved their learning environment, compared to the preschools that received EIBI only. Outcomes for autistic children and preschool staff did not differ significantly between the groups, despite positive descriptive findings. In study 3, four themes were identified as being key aspects of preschool programs with high quality to promote optimal development of children with ASD: (1) staff's competence, (2) children's inclusion and participation, (3) collaboration, and (4) learning environment. Overall, the stakeholders described the APERS-P-SE-based model as helpful in improving children's participation, preschool staff's engagement with the child, and optimizing child outcomes.

Taken together, the results indicate that APERS-P-SE is an instrument with a high level of content validity, and that it can be used in combination with in-service training and on-site coaching to improve preschool program quality for children with ASD.

Keywords: *Applied Behavior Analysis, Autism Spectrum Disorder, Early Intensive Behavioral Intervention, Learning Environment, Preschool.*

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Till Maja, Uno, och Niki.
Och Daniel Tjernström.

Abstract

The quality of the learning environment in preschool classrooms is of significant importance for children with autism spectrum disorder (ASD)[1]. However, very limited research has addressed how this environment can be improved. In regard to early intervention, most previous studies have primarily focused on child characteristics, and the importance of intervention content and quantity, rather than the broader learning environment in which interventions are delivered. Thus, the overall aim of this thesis was to study the quality of the learning environment for children with ASD. In particular, the focus was on children who receive Early Intensive Behavioral Intervention (EIBI) in community-based Swedish preschools, using the Autism Program Environment Rating Scale (APERS). Within this framework, three studies were conducted.

In study 1, we translated, culturally adapted, and systematically assessed the content validity of a rating scale designed to assess the program quality for children with ASD in preschool and school settings: the Swedish version of the APERS. In the process, the scale was modified to make the instrument as relevant as possible for the Swedish preschool context (this modified scale is henceforth referred to as APERS-P-SE). Nine experts rated the clarity and comprehensiveness of individual items in the scale, as well as the relevance of scale domains and the scale in its entirety. In study 2, we evaluated the use of APERS-P-SE as the foundation for professional development for preschool staff working with children with ASD receiving EIBI, to promote preschool learning environment quality for children with ASD (primary outcome), and outcomes for autistic children, and preschool staff (secondary outcomes). Using a quasi-experimental design, preschool staff either implemented EIBI enriched by in-service training and on-site coaching based on APERS-P-SE assessments ($k = 9$), or EIBI only ($k =$

[1] In this thesis, ”children with autism spectrum disorder (ASD)” and ”autistic children” are used interchangeably, as preference for either person-first or identity-first descriptors may vary both within the research as well as within the autism community.

8) during 8 months. A total of 17 children and 35 preschool staff participated, across 17 preschools. In study 3, individual interviews and focus-group interviews were conducted with preschool staff, preschool principals, habilitation supervisors, and parents to children with ASD who had participated in study 2 and received the APERS-P-SE-based intervention. Through these interviews, the different groups of stakeholders provided their thoughts about what they found to be the most important aspects of preschool programs for autistic children who receive EIBI. The participants also provided their opinions and experiences of participating in study 2. Thematic analysis was used to analyze all verbal data.

Study 1 demonstrated a high level of content validity for the Swedish version of the APERS, and that there is a current need for a scale such as the APERS-P-SE to improve the learning environment quality for autistic children in Swedish preschools. However, it may be regarded as too comprehensive for some users, as the scale poses high demands on the typical Swedish preschool. In study 2, the EIBI/APERS-P-SE preschools significantly improved their learning environment for children with ASD, compared to the preschools who received EIBI only. Outcomes for autistic children and preschool staff did not differ significantly between the groups, despite positive descriptive findings. In study 3, four themes were identified as being key aspects of preschool programs with high quality, and to promote the optimal development of children with ASD: (1) staff's competence, (2) children's inclusion and participation, (3) collaboration, and (4) learning environment. Overall, the different stakeholders described the APERS-P-SE-based model as helpful in improving children's participation, preschool staff's engagement with the child, and optimizing child outcomes. Of specific importance, stakeholders commented on how on-site coaching based on APERS-P-SE assessments was helpful to promote the overall quality of the preschool learning environment for children with ASD.

Taken together, the results indicate that APERS-P-SE is an instrument with a high level of content validity, and that it can be used in combination with in-service training and on-site coaching to improve preschool program quality for children with ASD, including what stakeholder groups perceived as key areas of preschool program quality for autistic children who receive EIBI. Implications for future research, clinical practice, and educational practice are discussed.

Keywords: Applied Behavior Analysis, Autism Spectrum Disorder, Early Intensive Behavioral Intervention, Learning Environment, Preschool

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List of publications

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Contents

Abbreviations

ABA Applied Behavior Analysis

ADHD Attention-Deficit/Hyperactivity Disorder

AKQ Autism Knowledge Questionnaire

APA American Psychiatric Association

APERS Autism Program Environment Rating Scale

ASD Autism Spectrum Disorder

BCBA Board Certified Behavior Analysist

CDC US Centers for Disease Control and Prevention

CEQ Children's Engagement Questionnaire

CGI-AUT Clinical Global Impression Scale – Autism

DTT Discrete Trial Training

DSM Diagnostic and Statistical Manual of Mental Disorders

EBP Evidence-Based Practice

EBP-Q Evidence-Based Practices Questionnaire

ECERS Early Childhood Environment Rating Scale

EIBI Early Intensive Behavioral Intervention

EVA Ethics, Values and Allegiance

FHS Föreningen Habilitering i Sverige

ICD International Classification of Diseases and Related Health

ICF International Classification of Functioning, Disability and Health

IEP Individual Education Plan

NAC National Autism Center

NCES National Center for Education Statistics

NPDC National Professional Development Center on ASD

SAU Services As Usual

SESSQ Self-Efficacy, Stress and Satisfaction Questionnaire

SKR Sveriges Kommuner och Regioner

SST Social Skills Training

SVS Social Validity Scale

TEACCH Treatment and Education of Autistic and related Communication Handicapped Children

WHO World Health Organization

Introduction

Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a neurodevelopmental condition defined by impairments in communication and social interaction, repetitive, stereotypical behaviors and restricted interests as well as sensory processing alterations, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013). The definitions and the diagnostic criteria for ASD have varied over the years but have always had challenges in social interaction and communication as core features.

The latest version of the DSM (DSM-5; APA, 2013) has merged several different previous diagnoses such as autistic disorder and Asperger's disorder, to the single-dimensional construct of ASD (Rosen et al., 2021). The severity of each criterion, as well as the presence or absence of other disabilities such as intellectual disability and language impairments, should be included in diagnostic reporting. For a clinical diagnosis, the individuals' challenges must have been present during early childhood and must cause impairments in daily functioning (APA, 2013).

Prevalence and co-occurring conditions

ASD is the condition with the most increasing diagnosis rates of any developmental disability in recent years (Centers for Disease Control and Prevention [CDC], 2020). It is estimated that about 1% to 3% of all children in high-income countries in Asia, Europe, and North America fulfill diagnostic criteria (CDC, 2018; Maenner et al., 2020). In Region Stockholm, Sweden, 2.4% of all boys and 0.8% of all girls aged 0 to 12 years are estimated to have ASD. For children between 13 to 17 years of age, figures are higher, and in this group, 4.8% of all boys and 2.7% of all girls are estimated to have an ASD diagnosis (Bölte et al., 2020). ASD can commonly be identified as early as 24 months of age (Johnson et al., 2007), although estimates (Daniels & Mandell, 2014) report that

the mean age of diagnosis is much later (i.e., means across studies range between 36 and 120 months). Moreover, recent epidemiological data suggest that children are not only diagnosed with ASD more often today but also at a younger age for each cohort (Schendel & Thorsteinsson, 2018). Children with ASD in the average intellectual range are usually identified during later childhood or adolescence while children with ASD and intellectual disability typically are identified and diagnosed at a younger age (Kosidou et al., 2017).

ASD frequently co-occurs with other diagnoses such as attention-deficit/hyperactivity disorder (ADHD), speech and language impairments, epilepsy, genetic syndromes, and intellectual disability (Cashin et al., 2018). Physical impairments are also common for individuals with ASD. Intellectual disability is the most common co-occurring condition, with estimations of about 30% co-occurrence (Maenner et al., 2020; Vaz et al., 2021).

ASD is a diagnosis that typically remains stable over time, although significant improvements in functioning can be achieved (Eldevik et al., 2009; Guthrie et al., 2013; Smith et al., 2019), and some individuals diagnosed with Asperger's disorder in their youth may not fulfill diagnostic criteria as adults (Helles et al., 2017). In regard to gender, it is estimated that about three times more boys than girls are diagnosed with ASD (Idring et al., 2015; Loomes et al., 2017).

Impact on psychosocial functioning and quality of life

Impairments in communication as well as in language are as previously noted defining parts of an ASD diagnosis. The level of functioning may however vary between individuals. Some never develop speech, some may only produce a few words, or may use language repetitively (i.e., echolalia), while others demonstrate superior language ability, although often with a limited understanding of abstract language (Brignell et al., 2018; Neely et al., 2016). Furthermore, for young children, repetitive and stereotyped behaviors, and limited interests and activities, are defining features of ASD that impact daily functioning to various degrees. Some children may display relatively high degrees of flexibility, while for others, behaviors such as meticulously following routines, or fixating on specific items or activities such as lining up toys, may consume almost all of their time (Raulston et al., 2019), which if not addressed will limit learning opportunities.

Apart from the core traits of ASD, the diagnosis typically has a far broader impact on functioning and quality of life, although this varies between individuals (Bölte et al., 2019b; Schipper et al., 2016; van Heijst & Geurts, 2015). For example, many individuals with ASD experience atypical sensory processing. Research suggests that over 96% of all autistic children display either hyper- or hypo-sensitivities over multiple domains, such as visual, auditory, or tactile perception. However, these also range from limited to severely impacting the individual's daily functioning (Marco et al., 2011).

For children with hypersensitivity, distress caused by sensory stimuli may evoke aggressive and self-injurious behaviors, as well as an increased vulnerability to developing specific sensory-related phobias related to sounds (Kerns et al., 2014; Marco et al., 2011). Furthermore, children with ASD are often highly selective eaters, as different textures and odors may be perceived as unpleasant. This food selectivity is associated with significant problems, as restricted diets may result in inadequate nutrition, and it is the major reason for referrals to nutrition services within the group (Cermak et al., 2010). Also, heightened sensory sensitivity among children diagnosed with ASD may evoke stress and anxiety in many situations, compared to typically developed peers (Corbett et al., 2016).

Children and adolescents with ASD also experience sleep problems in general, and insomnia in particular, to a much higher extent than typically developing peers (Cortesi et al., 2010). In the literature, indications exist that sleep problems may exacerbate symptom severity, and possibly negatively influence the effectiveness of early intervention (Schreck, 2004).

Among other challenges that have been identified as typically faced by autistic individuals by experts within the assessment and treatment of ASD, are the ability to manage everyday life, to take care of oneself, motor skills, cognitive skills, and participation in social life, school- and work settings (Schipper et al., 2016). For children and adolescents, experiences of being targeted for bullying are common (Schroeder et al., 2014). Many children and adolescents with ASD also suffer from anxiety and depression (Strang et al., 2012). Furthermore, children and adolescents with ASD also experience lower levels of quality of life (Lee et al., 2008), including physical health, psychosocial health, emotional functioning, social functioning, and school functioning, compared to typically developed peers (Kuhlthau et al., 2010). Moreover, individuals with ASD face an increased risk to die prematurely compared to the general population (Hirvikoski et al., 2016).

In contrast to the challenges associated with an ASD diagnosis, it is also important to highlight the specific strengths. For example, traits such as detail-orientation and pattern-detection, and qualities relating to social interaction such as honesty and loyalty, can be advantageous in supportive settings. Other examples of specific strengths identified in research include the ability to hyperfocus, self-determination, good memory, analytical and logical thinking, and creativity (Russell et al., 2019; Warren et al., 2021).

Thus, to summarize, research to date indicates that individuals with ASD face challenges in a broad set of areas including education, social relationships, self-care, and domestic life (Bölte et al., 2019a), and that individuals with ASD report lower life satisfaction than individuals without ASD (Helles et al., 2017; Jonsson et al., 2017; van Heijst & Geurts, 2015). Research to date also suggests that children with ASD in general face a poor prognosis, with poor psychosocial outcomes, and maintaining or increasing levels of disability over time (Billstedt et al., 2005; Hofvander et al., 2009; Mordre et al., 2012). However, substantial variation exists in level of functioning and developmental trajectories. Individual outcomes correlate negatively between quality of life and symptom severity (Helles et al., 2017), and may vary depending on factors such as socio-demographic background (Fountain et al., 2012), family support (Woodman et al., 2015), intelligence (Kirby et al., 2016), and accessibility to early interventions such as Early Intensive Behavioral Intervention (EIBI; Dawson et al., 2012).

Impact on family

Parents to autistic children and adolescents more frequently experience depression and anxiety, as well as elevated rates of divorce and sick leave, compared to parents with typically developed children (Mugno et al., 2007; Rao & Beidel, 2009; Schieve et al., 2007). Furthermore, research also suggest that parents of children with ASD experience more stress than other parents (Pastor-Cerezuela et al., 2016; Rao & Beidel, 2009; Schieve et al., 2007), with a positive correlation between the severity of children's ASD symptoms, behavioral problems, and general stress level (Miranda et al., 2019). Higher rates of stress among parents to children and adolescents with ASD may partially be explained by the extensive contacts with authorities, healthcare services, and educational institutions that are typically experienced (Hayes & Watson, 2013). Many parents also report that the lack of coordination

between the abovementioned authorities, and lack of overall societal support, have left parents with the burden of taking responsibility for coordination and securing support for their children (Hayes & Watson, 2013; Westman Andersson et al., 2017).

Biomedical and bio-psycho-social model of disability and ASD

ASD has traditionally been conceptualized as an attribute or deficit located within the individual (Smart & Smart, 2006), adhering to a biomedical conceptualization of disability and ASD. Accordingly, the diagnostic manuals commonly used to assess and diagnose individuals with suspected neurodevelopmental conditions (DSM-5; APA, 2013; ICD-10; World Health Organization [WHO], 1992) focus on the biomedical aspects of disability and classify health conditions within the individual (Bölte et al., 2019a).

In contrast to the biomedical approach of categorizing disability as with the DSM-5 and the ICD-10, other models have been developed to appraise ASD from a more holistic perspective. One example is the International Classification of Functioning, Disability, and Health (ICF), which is a bio-psycho-social model developed by the WHO. It provides a comprehensive framework for functional ability and disability, including social, personal, and environmental factors of health-related functioning (WHO, 2001). ICF was recently used as the foundation for developing a brief tool to assess ASD-related functioning, with the purpose of applying categories from the ICF to describe the impact of health condition on individual functioning (Bölte et al., 2019a). Thus, such an approach deviates from the traditional biomedical understanding of disability where both the cause of the disability and the treatment rest within the individual (Bölte et al., 2021; Smart & Smart, 2006).

Interventions in ASD

ASD is currently not considered curable from a medical standpoint (Bölte, 2014), and by some, it is considered a cognitive and behavior style rather than a disorder (Baron-Cohen, 2017). However, several interventions have been developed during the last decades with the aim of improving functioning, reducing symptom severity, and preventing

co-occurring psychiatric conditions such as depression and anxiety (Hirvikoski et al., 2015). These interventions thus serve somewhat different purposes, from different standpoints (i.e., pharmacological, psychological, psycho-educative, educational), although definitions can vary. They may be directed more toward the environment of the individual, or more frequently, toward the individual. Interventions may be provided to preschool-aged children, older children including adolescents, and adults. However, a large proportion of evidence-based interventions concern early intervention, which can be defined as services and support to young children with developmental delays and their families (CDC, 2018), as research indicate that early intervention (i.e., from 0 to 6 years) is more likely to have significant long-term positive effects on later skills and symptom severity, compared to providing intervention to older individuals (National Institute of Child Health and Human Development, 2021).

Environment directed interventions

Psycho-educative, or educational and pedagogical interventions and methods, are used either to primarily help autistic individuals acquire new skills or to adapt their environment. In regard to the latter, one may use the term "environment directed interventions". These interventions address the physical, social and instructional features of a classroom, or other educational settings (Odom et al., 2018). The most widely used intervention is Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH). It was developed by Eric Schopler in 1966 (Schopler & Reichler, 1971). The main focus of TEACCH is to design environmental accommodations in line with the individual's challenges and interests, to promote learning and independent functioning in the classroom (Odom et al., 2021; Welterlin et al., 2012). Structured teaching is emphasized, with a focus on strategies to enhance visual processing, including the physical structure of the classroom, using visual activity schedules, visual teaching systems, and also the involvement of parents in providing the intervention within home settings (Eikeseth, 2009; Welterlin et al., 2012).

Another intervention model which also focuses on the learning environment in educational settings, in relation to the learning and functioning of autistic children and adolescents, was developed by the United States (U.S.) National Professional Development Center on

ASD (NPDC). In the NPDC model, assessments of the learning environment serve as the foundation for in-service training, and implementation of evidence-based practices (EBPs) through the process of on-site coaching, which when combined form a comprehensive intervention program (Odom et al., 2013; Sam et al., 2020a). To assess the quality of program environments for children and youth with ASD, NPDC researchers designed the Autism Program Environment Rating Scale (APERS). The scale is comprehensive and was designed to assess the overall program quality, as well as individual domains that are features of the autism program (See Table 1). One version of the instrument focuses on preschool- and elementary school settings (APERS-PE; Odom et al., 2018), while the other version targets middle school and high school settings (APERS-MHS; Odom et al., 2018). In addition, a self-assessment scale has been developed as a complement, for teachers to complete and compare with ratings done by an external rater. Based on observations, reviews of individual education plans (IEPs), and interviews with parents and preschool- or school staff, the information generated by administering the APERS allows the assessor to identify areas of strengths and weaknesses in the preschool- or school setting. The information can then be used to develop an action plan for improving the quality of the learning environment for children with ASD in the classroom, in collaboration with the preschool- or school staff. Thus, APERS can be used both to assess the learning environment of children with ASD and to serve as means for intervention planning.

Table 1. Description of APERS domains.

APERS domains	**Description of content**
Learning Environments	Safety, organization, materials, visual schedules, transitions
Positive Learning Climate	Staff-student interactions, staff behaviors
Assessment and IEP Development	Assessing student progress, assessment process, IEP goals, transition planning
Curriculum and Instruction	Classroom instruction, focus on IEP goals, opportunity to generalize, prompting, accommodations

Communication	Planning for communication, communication rich environment, individualized communication instruction, responsiveness to student, communication systems
Social Competence	Arranging opportunities, teaching and modeling, personal hygiene and relationships, social skills training, peer social networks
Personal Independence and Competence	Self-advocate for accommodations, self-management, choices available
Functional Behavior	Proactive strategies, behavioral assessment, data collection, teaming
Family Involvement	Teaming, communication, parent teacher meetings
Teaming	Team membership, team meetings, decision making

Individual directed interventions

Pharmacological treatment

There are currently no medical treatments considered evidence-based that target core ASD features or symptoms (Bölte, 2014; Matson & Burns, 2019). Rather, for individuals with ASD, pharmacological interventions typically target common challenges such as depression and anxiety, or behavior difficulties such as hyperactivity, stereotypies, and irritability. To treat depression and anxiety, and sometimes stereotypies, selective serotonin reuptake inhibitors (SSRIs) may be used. For hyperactivity, methylphenidate (e.g., Ritalin) is commonly applied, and for aggression and irritability, and sometimes also severe stereotypies, various antipsychotics may be induced, such as Risperidone and Haloperidol (Kaplan & McCracken, 2012; Matson & Burns, 2019).

Psychological treatment

Psychological interventions are sometimes applied to address co-occurring psychiatric conditions such as anxiety, obsessive-compulsive disorder (OCD), and depression. Both individual and group treatment formats are used. Cognitive-behavioral therapy (CBT) has shown positive

effects for autistic children and adolescents, foremost on levels of anxiety, but also overall ASD symptom severity (Kreslins et al., 2015; Sukhodolsky et al., 2013; Wood et al., 2015). Recently, researchers have evaluated a form of CBT called Acceptance and Commitment Therapy (ACT) for adolescents and adults with ASD, to reduce stress, emotional distress, and to increase psychological flexibility (i.e., the skill of experiencing thoughts, emotions, and body sensations non-judgmentally, and to take action towards goals based on personal values), with promising results (Pahnke et al., 2014, 2019).

Psycho-educative interventions

As previously noted, psycho-educative interventions typically focus on supporting the learning of autistic individuals, or making accommodations in environmental settings. A vast number of interventions exist, and the great majority of these are directed toward the individual, albeit targeting different skills and functions. Some interventions are compensative, as Augmentative and Alternative Communication (AAC), which focuses on supporting the individual's communication (Beukelman et al., 2012), or Social Narratives, which helps autistic individuals interpret and understand social situations, for example with the use of comic strips (Glaeser et al., 2003; Steinbrenner et al., 2020). However, apart from a more compensative approach, psycho-educational interventions based on the principles of Applied Behavior Analysis (ABA) have proved to be the most effective for improving development and teaching socially significant skills in both clinical and educational settings, according to a number of systematic reviews including both single-case and group-design studies (National Autism Center [NAC], 2015).

ABA is a field of research devoted to understanding and improving human behavior. In ABA, tactics from the science of behavior are systematically applied to improve socially significant behaviors (Baer et al., 1968; Cooper et al., 2019). Accordingly, several strategies have been developed within the science of ABA to promote learning and acquisition of new skills. These key strategies and procedures include the use of functional analysis of behavior, reinforcement, prompting, shaping, chaining, and generalization (Wong et al., 2015).

Intervention models for autistic individuals based on ABA can consist of focused interventions or comprehensive intervention programs and have in common that they should address socially significant behaviors (NAC, 2015; Wong et al., 2015). Focused interventions target single skills or goals within one developmental area, such as speech, alternative communication, or daily living skills (Wong et al., 2015).

Focused interventions tend to go on for a shorter amount of time, until the goal is reached, and the skill is acquired. One example of evidence-based focused interventions based on ABA is Social Skills Training (SST; Kaat & Lecavalier, 2014; Wong et al., 2015) to promote social skills, which is often done in group settings. Another example is Discrete Trial Training (DTT; Lerman et al., 2016; Wong et al., 2015), to promote learning of new skills using a structured, adult-initiated, planned, and controlled one-to-one approach.

In contrast, comprehensive intervention programs typically consist of a set of embedded focused interventions, which are individualized, and designed to address a broad set of behaviors inherent in ASD in different developmental areas such as social interaction, communication, motor skills, and challenging behaviors, organized around a conceptual framework (Steinbrenner et al., 2020; Wong et al., 2015). Furthermore, a comprehensive intervention program also includes manualized procedures, specifications of intensity (i.e., number of hours provided per week), longevity (i.e., for how long the intervention takes place), and what outcomes to target (Odom et al., 2010; Steinbrenner et al., 2020). Although up to 30 different comprehensive intervention models have been identified, including previously mentioned TEACCH, and models based on ABA with varying degrees of evidence-base such as Early Start Denver Model (Dawson et al., 2010) and Pivotal Response Training (Koegel & Koegel, 2012), the model with the strongest evidence of efficacy to date is EIBI (Odom et al., 2010; Reichow et al., 2014).

Early Intensive Behavioral Intervention

EIBI dates back to the 1960's when pioneering research conducted at the University of California at Los Angeles by Lovaas et al. (1973) evaluated a new, systematic way of applying behavior analytic procedures to teach 20 children with ASD socially significant behaviors. Although many of the children did not maintain their acquired skills after the intervention, this study laid the foundation of what would later become EIBI (Klintwall & Eikeseth, 2014; Lovaas, 1981).

Following his earlier work, Lovaas (1987) conducted a quasi-randomized study with a high-intensity intervention group (n = 19), and two less intense control groups (n = 40). In the high-intensity group, young children (i.e., less than 4 years of age at onset of the study) with ASD were provided with one-to-one instruction for an average of 40

hours a week during two years, in home and community settings. The intervention was provided by well-trained student therapists, and children's parents, and addressed all types of skill deficits of their children, in various situations throughout the day. Following the study, nine out of nineteen children in the high-intensity intervention group were assessed as having an intellectual level within the normal range and could be enrolled in regular school classrooms without any special education support. In the two control groups, only one of the 40 children obtained placement in a regular school setting. Although several researchers such as Howlin (1997), Gresham and MacMillan (1997), and Schopler et al. (1989) have questioned the methodological rigor of this pioneering research, it has unquestionably sparked more research in EIBI, with further development of study designs and systematic evaluations.

Approach and principles

EIBI can be defined as the use of evidence-based principles and procedures from the field of ABA, to support preschool-age children with ASD to learn functional and adaptive skills. Although the actual practice may differ, EIBI programs are systematic, highly structured, and comprehensive. They are based on manualized curriculums, and typically move from early and basic skills to more complex skills, with the overarching goal of teaching young children socially significant behaviors (Eikeseth, 2010; Klintwall & Eikeseth, 2014; NAC, 2015).

EIBI involves a wide range of focused EBPs which can be both child- and adult-initiated. EIBI programs are individualized to children's specific needs, and usually address a broad range of behaviors for children with ASD that may be challenging such as social interaction, communication, and motor skills. The programs can be implemented in various and sometimes multiple settings such as at home, at a clinical center, or in a community-based preschool, and are supervised by trained professionals (Klintwall & Eikeseth, 2014).

Positive reinforcement is used as a key ingredient to promote learning and reduce challenging behaviors. For evaluation, to set goals, and for selecting between specific teaching procedures such as DTT or incidental teaching (Hsieh et al., 2011), data are continually collected (Eldevik et al., 2019). Generally, it is recommended to start an EIBI program between 2 and 5 years of age, to continue the program over two years, and to provide instruction for a minimum of 20 hours a week (Klintwall & Eikeseth, 2014).

Treatment effects and efficacy

In research, and in contrast to focused interventions that target individual skills and evaluate goal attainment, comprehensive programs such as EIBI typically apply broader standardized measures and standard scores to assess progress. Adaptive behaviors, symptom severity, and intelligence quotient (IQ) are common constructs that are examined pre- and post-intervention. However, it has also been questioned whether standardized measures on broad overall functioning really capture the discrete, observable behaviors that are typically targeted within EIBI programs (MacDonald et al., 2014; Sam et al., 2020a).

Nonetheless, several meta-analyses and systematic reviews have been published on standardized EIBI outcomes. Overall, the largest effect sizes have been detected for IQ, and moderate effect sizes for adaptive behaviors (Eldevik et al., 2009; Klintwall, Eldevik, et al., 2015; Makrygianni et al., 2018; Reichow et al., 2014, 2018; Reichow & Wolery, 2009), as well as a low- to moderate effects on social communication outcomes (Fuller & Kaiser, 2020). Effects on cognitive, social, communication, and adaptive functioning have also been evaluated based on only community-based studies, with smaller albeit significant gains, compared to meta-analyses including efficacy studies where the EIBI was provided by university-based experts in specialized treatment centers (Nahmias et al., 2019).

In Sweden, only a small number of studies have evaluated a community-based implementation of EIBI. In a recent naturalistic study by Haglund et al. (2020), EIBI was found to significantly improve symptom severity among 67 autistic children, while no improvements in symptom severity were found for the 27 children in the comparison group who had received community treatment as usual. In a prospective naturalistic study conducted by Fernell et al. (2011), 208 children who had received either EIBI or less intensive ABA-based intervention were evaluated based on changes in adaptive behaviors between onset and termination of intervention. The research team found that composite scores significantly improved over the two years of study. However, the gains were accounted for by children with cognitive functioning within the normal range, while children with lower IQ showed no significant improvements. Additionally, the authors found no difference between the high-intensity and low-intensity group. It should however be noted that information concerning treatment fidelity was lacking in both

groups, making group comparisons based on intensity highly questionable. In another study, by Spjut Jansson et al. (2016) including 100 children diagnosed with ASD, EIBI was compared to either low-level intensity intervention based on ABA, or eclectic intervention. No differences were identified in regard to children's adaptive behaviors or overall severity of impairment, after two years of intervention. However, variance increased between children during the course of the study, underscoring the need for monitoring individual children's development (or lack of development), and to change or modify intervention programs accordingly. Taken together these findings provide somewhat contradictory indications of the effectiveness of community-based EIBI implementation in Sweden.

There is limited research on the long-term outcomes of EIBI. In a recent study by Smith et al. (2019), adolescents who had received EIBI as young children and improved both IQ and adaptive behavior outcomes at discharge, maintained their gains 10 years after the EIBI program had ended. In another, much earlier study, by McEachin et al. (1993), treatment gains were found to be maintained four to five years after the EIBI had ended. In contrast, Kovshoff et al. (2011) found that gains were not maintained two years after the treatment ended. However, the results suggested that maintenance of EIBI gains depended on whether the EIBI had been parent commissioned or university-supervised, in favor of instruction of EIBI managed by parents.

In addition to individual outcomes, one may also consider societal outcomes. In a study conducted by Chasson et al. (2007), the authors address the vast economic implications of the increased rates of children diagnosed with ASD. Using the state of Texas as a reference, the authors estimated a general saving for the state of Texas of about $208.000 for each child over the span of 18 years if they received three years of EIBI instead of 18 years of special education with no EIBI, which equals to a state saving of more than 2 billion dollars across all autistic children. In another study on cost comparison by Peters-Scheffer et al. (2012), the authors discussed the short-term costs of EIBI in comparison with long-term costs of no EIBI using the Netherlands as reference. The authors estimated a total saving of over €1.000.000 per individual with ASD over a span of 3 to 65 years of age, calculated on costs for long-term (special) education, work, and living. Extended to all autistic individuals in the Netherlands, this would add up to saved costs of approximately €109 - €180 billion.

Prediction of treatment effects

On child level, there is research suggesting that age, developmental level, and symptom severity may predict EIBI outcome. Overall, research to date seems to indicate that younger age at intake is associated with better outcomes (Eldevik et al., 2012; Flanagan et al., 2012; Harris & Handleman, 2000; Perry et al., 2013; Smith et al., 2015). However, there are also studies where no significant association between age at intake and outcome has been observed (Eikeseth et al., 2007; Howlin et al., 2009; Rogers & Vismara, 2008).

More consistent are the findings that suggest that developmental level (i.e., IQ) predicts EIBI outcome. Several studies have shown that higher IQ before the onset of EIBI has predicted regular school placement, improvements in socialization, and overall learning rate (Eldevik et al., 2012; Harris & Handleman, 2000; Howlin et al., 2009; Klintwall, Eldevik, et al., 2015; Perry et al., 2013; Rogers & Vismara, 2008; Smith et al., 2015). Also, autistic children with higher symptom severity and less adaptive behaviors before the onset of EIBI seem to have worse odds of successful outcomes as compared to children with more adaptive behaviors, and less symptom severity (Eldevik et al., 2012; Smith et al., 2000). Specifically, findings from several studies suggest that children's social engagement and interest positively correlate with better EIBI outcomes (Klintwall, Macari, et al., 2015; Klintwall & Eikeseth, 2012; Smith et al., 2015).

On a contextual level, there are several factors that are known to influence EIBI outcomes. Supervisor credentials and experience have been found to have an influence, with children making significantly more progress when supervisors with Board Certified Behavior Analyst (BCBA) credentials[12] are supervising the EIBI program, or when a supervisor has extensive experience in supervising (Dixon et al., 2016). Another factor seems to be the intensity of supervision (Eikeseth et al., 2009), although other studies (Dixon et al., 2016) have found no relation between supervision intensity and children's outcome. Also, recent research suggests that the quality of EIBI (i.e., how accurately the intervention is performed), predicts clinically significant change for children who receive EIBI (Långh et al., 2020; Leaf et al., 2016). Furthermore, several studies report a positive correlation between EIBI inten-

[2] Supervisors with a master's degree in psychology, speech and language pathology, behavior analysis, or special education, with additional specialization consisting of graduate-level behavior analytic coursework and supervised field work.

sity and valued outcomes (Eldevik et al., 2010, 2019; Klintwall, Eldevik, et al., 2015; Linstead et al., 2017; Reed et al., 2007; Virués-Ortega, 2010). It should however be noted that no broad consensus exists on how to define what counts as intervention and not, and thus how to count and measure the amount of instruction provided in minutes and seconds (Eldevik et al., 2012; Odom et al., 2012; Rogers & Vismara, 2008).

Teachers' expertise (or lack of expertise) in providing instruction to children with ASD (Eldevik et al., 2019), and teachers' attitudes towards EIBI, may also influence EIBI outcomes when implemented in community-based educational settings (Eldevik et al., 2012). Negative attitudes have been found to be associated with less treatment fidelity, less quality of performance (McLeod, 2009), and with overall poorer outcomes (Klintwall et al., 2012). Thus, independent of factors such as EIBI quality, supervisor experience and credentials, and intensity of supervision and intervention, community-based programs will at the end of the day be dependent on the performance of the staff and the parents who are actually providing the intervention (Långh et al., 2020). Furthermore, in addition to preschool staff's expertise and attitudes, it can also be hypothesized that a vast array of other aspects of the preschool learning environment quality for autistic children may influence outcomes, such as for example opportunities to interact with peers serving as role-models, or the structure of the physical environment (Eldevik et al., 2012; Fixsen et al., 2009; Grindle et al., 2009; Odom et al., 2013).

The Swedish support system

In Sweden, there is free access to universal health care for children, and children are routinely screened for developmental delays at child health centers (Idring et al., 2015; Wettergren et al., 2016; Wilder, 2015). Children who are suspected of fulfilling diagnostic criteria for ASD are in most regions referred to specialized clinics within the child- and adolescent psychiatry, for assessment. Following an ASD diagnosis, children and families are entitled to support services provided by the state, municipalities, or regional county councils, under a number of national legislative acts including (1) Act Concerning Support and Service for Persons with Certain Functional Impairments (1993:387), (2) Health and Medical Services Act (2017:30), (3) Social Services Act (2001:453), (4) Education Act (2010:800), (5) Special Transport Act (1997:736), (6) Act on Housing Adaptation Grants (1992:1574), and (7) Social Insurance Code (2010:110). Under these acts, autistic individuals and their families are, for example, entitled to relief service in the

home (i.e., to provide respite for families) and short stays away from home to provide time for recreation and a change of environment, while relatives are provided with respite.

Healthcare services such as habilitation fall under the jurisdiction of regional county councils, while education services fall under the jurisdiction of the municipality (Socialstyrelsen, 2020). Following diagnosis, preschool-aged children and their families are typically referred to a regional habilitation center specialized in early intervention for further support and guidance (Fernell et al., 2011). Habilitation centers provide center-based education and supervision to parents and preschool staff. In the Stockholm Region, approximately 90% of the children with ASD obtain focused interventions (e.g., SST to promote communication and play skills), and the remaining 10% obtain comprehensive intervention models (i.e., EIBI). In addition, in some counties, however rarely, children with ASD may receive assistance in their preschool from centralized municipality-based special education support teams (Wilder, 2015) as a complement to, or instead of external supervision from a habilitation center.

Habilitation services

Habilitation services in Sweden have the mission of offering advice, support, and treatment to young children, adolescents, and adults with lifelong disabilities such as ASD, intellectual disability, mobility impairments, deaf- or blindness, and acquired brain injury, based on evidence and best-practice. Advice and support is also provided to family, relatives, and staff in the individual's immediate environment (Föreningen Habilitering i Sverige [FHS], 2020; Vårdgivarguiden, 2020). Habilitation services include speech therapy, behavioral interventions, physiotherapy, occupational therapy, and psychoeducation, and services are typically provided through multi-disciplinary teams (Spjut Jansson et al., 2016; Zakirova-Engstrand et al., 2020). Overall, the aim is to provide support and to make adaptions to promote optimal quality of life and development for the clients.

For young children with ASD, primarily psycho-educative intervention and support is provided, mainly targeting communication and social interaction. However, many autistic children also receive other forms of support, including adjustments in home- and school settings, and assistive technology such as time aids. Thus, support may be based

on the principles of ABA, TEACCH, or provided in other forms. Additionally, lectures, workshops, and support groups are offered to families and preschool staff to educate on autism and provide support (Zakirova-Engstrand et al., 2020). It should however be noted that there are regional differences in how the local habilitation centers are organized, and which supports and services are provided.

The habilitation staff who provide support and supervision to autistic children and their families have different educational- and professional backgrounds, including psychologists, speech and language pathologists, occupational therapists, and special education teachers. For the habilitation staff who provide supervision on focused interventions and EIBI, most supervisors have at least basic knowledge and training in ABA and receive regular clinical supervision from experienced staff, who may sometimes, although rarely, be BCBAs (Bejnö et al., 2021).

EIBI within the Swedish habilitation

Recommendations by the Swedish Board of Habilitation Directors (FHS, 2012) guide comprehensive interventions (i.e., EIBI). Within the Swedish support system responsibility is divided between organizations, and EIBI programs should be established in close collaboration between the habilitation center, the municipality, and the preschool. The habilitation center is responsible for the development of an individual EIBI program, and to educate and supervise the implementation of the program. The preschool is in its turn responsible for the main part of the EIBI implementation, while children's parents are responsible for additional implementation at home. Furthermore, for the program, every child should have an individual plan stating overarching goals and division of responsibilities (Socialstyrelsen, 2008), which all stakeholders agree on. Children's individual EIBI programs should entail a detailed account of developmental goals that are observable and measurable, as well as describing how the EIBI implementation should be done in regard to timing, setting, extent, and duration. In EIBI programs, all goals should aim at positively influencing the child's participation in preschool, home, and societal activities. The recommendations by FSH (2012) also state that preschool staff- and parents are to be provided with continuing education during the course of intervention and that the targeted children should spend as much time as possible with typically developed children in their preschool while provided with the intervention.

Typically, the EIBI supervisor provides weekly supervision during the first year of EIBI implementation but may transition to bi-weekly supervision during the second year. The supervision is mainly provided at the centralized habilitation center, with occasional visits to the preschool and the home. In the supervision meetings, both the child, the parents, and a paraprofessional from the child's preschool typically participate.

In regard to the contents of the Swedish EIBI programs, in the guidelines, much emphasis is placed on social interaction with peers, as well as play skills. Other valued areas to be targeted are functional and spontaneous communication, reduction of problem behaviors through functional analysis, and improvement of cognitive skills as well as adaptive behaviors (i.e., daily living skills) (FHS, 2012).

Preschool

In Sweden, children may start preschool from the age of 1 year, and almost all children attend preschool. Specifically, about 95% percent of all children between 3 and 4 years of age, and 85% between 1 and 5 (National Center for Education Statistics [NCES], 2017; Sveriges Kommuner och Regioner [SKR], 2018) attend preschool. Parents pay a fee between 1% and 3% percent of their income for their child to be enrolled in preschool, with no additional fees for potential supplemental resources such as designated paraprofessionals, assistive technology, or adjustments in the physical learning environment. Typically, the preschool applies for funding for extra support based on staff reports of special needs among children within the group (Sandberg et al., 2010).

All preschools are community-based and may be either municipal or independent governed. In 2013, the majority (80%) of all children attended municipally governed preschools (Skolverket, 2014). All preschools are tax-subsidized and publicly funded, independent of their governance, and adhere to the same national education act (2010:800) and curriculum (Skolverket, 2018). The Swedish national curriculum (Skolverket, 2018) was established by the Swedish Government and parliament. It describes the values and goals which all preschools must strive towards, such as democracy, inclusion, life-long learning, and learning through play. The national curriculum states that all children shall receive an education adapted to their specific needs, to promote optimal development. Children that need momentary or permanent special support should be provided with such support based on their individual needs and preconditions. However, no guidelines are provided

on what methods or strategies the preschools should use. Consequently, many different methods and pedagogical approaches are applied (Sandberg et al., 2010; Skolverket, 2018), including partially isolating children with special needs from other children, supporting the group rather than the individual, or inviting peers to interact with the child (Sandberg et al., 2010).

The Swedish preschool is thus for all children, including children with disabilities. A formal diagnosis is however not required for a child to be considered to have special needs. Rather, special needs are assessed by the preschool staff in collaboration with the child's parents, which may explain why most children considered to have special needs in the Swedish preschool do not have a formal diagnosis (Lillvist & Granlund, 2010). The assessment is typically based on how the child interacts and functions with peers in the preschool environment (Granlund & Lillvist, 2015). Following the assessment, according to the Swedish education act (2010:800), the preschool is required to somehow meet the needs of the child. This comprises adjustments of the social and physical environment, to meet the need of every child (Sandberg et al., 2010). Nonetheless, there are no formal requirements or guidelines on how to practically plan for, provide, or assess the support provided. In some municipalities and preschools, so-called action plans (Skolverket, 2005) are used. These may have some resemblance with IEPs which are mandatory in other countries such as the U.S. (2011), and the action plans that are mandatory for school-aged children in Sweden (Skollag 2010:800). In the preschool action plans, the individual child's strengths, need for support, planned interventions, and targeted behaviors may be documented. Typically, children's goals concern supporting the child in various playtime activities, as free play constitutes a central part of children's learning in the Swedish preschool (Skolverket, 2018).

In sum, learning through play, inclusion and participation are philosophical cornerstones of the Swedish preschool (Lundqvist et al., 2016; Nilholm, 2014; Skollag 2010:800; Skolverket, 2018). Accordingly, the individual interests and needs expressed by the child should guide how the education is planned (Skolverket, 2018). However, except for being in the same group as typically developed children, which may be referred to as a "placement definition" of inclusion (Göransson & Nilholm, 2014), neither the national education act nor the national curriculum clearly define participation and inclusion, and no practical guidelines are provided.

Learning environment

Learning environment can as previously noted be described as the social, physical, and instructional features of educational settings such as preschool- or school classrooms (Odom et al., 2018), including structural characteristics such as class size, and process features such as the interaction between teachers and children (Anders et al., 2012; Leifler et al., 2020).

The quality of early education programs (i.e., the immediate environments and the processes within) have been associated with children's outcomes, including language, social and cognitive development (NICHD Early Child Care Research Network, 2002; Schmerse et al., 2018). Specifically, structural features such as child-staff ratio, staff's level of education and training, as well as process features like teachers' sensitivity and responsiveness to children's interaction, have shown to be associated with higher levels of children's engagement (Granlund et al., 2016), and better developmental outcomes (NICHD Early Child Care Research Network, 2002). Furthermore, lower child-staff ratios, smaller group sizes, and more educated and trained staff has been shown to predict child-teacher interaction with higher quality, as well as children's performance in various tasks (NICHD Early Child Care Research Network, 2002).

Because of the importance and impact of learning environment quality, several checklists and rating scales for educative settings have been developed over the years. The majority of such assessments have focused on the learning environment in early childhood education. Among the most widely used and psychometrically evaluated, The Early Childhood Environment Rating Scale (ECERS; Harms et al., 2014), and the Classroom Assessment Scoring System (Pianta et al., 2008) stands out as specifically well-established in evaluations of early childhood education programs. For ECERS, the scale has been translated into Swedish and used within the Swedish preschool context (Kärrby, 1989; Kärrby & Giota, 1994). In addition to assessments of the general learning environment, the Inclusive Classroom Profile (Soukakou, 2016) has been developed and designed to rate the learning environment features in preschool for children with disabilities in particular. The scale has also been evaluated psychometrically and used within the Swedish preschool context (Lundqvist et al., 2016; Soukakou, 2012).

To meet the need for supportive environments for children with ASD in particular (Lindsay et al., 2013), the Autism Program Quality

Indicators (Crimmins et al., 2001) was developed to assess learning environment quality for children with ASD in New York, including program features such as curriculum and parent involvement. In Belgium, Renty and Roeyers (2005) produced a questionnaire to examine adaption of the school environment, school staff's knowledge about ASD, parent involvement, and services available. However, no psychometric properties have been presented for any of the abovementioned scales, designed specifically to assess the learning environment for children with ASD (Odom et al., 2018).

Due to the increased prevalence of children with ASD, indications that school systems did not provide adequate educational settings and services, and the subsequent need for a comprehensive and psychometrically evaluated scale (Odom et al., 2013), the previously mentioned APERS (Odom et al., 2018) was developed. Based on a literature review of rating scales, the NDPC used and modified items from other scales such as the ECERS, created new items, and organized the contents into categories to reflect all important features of the learning environment of educational programs for children with ASD. (Odom et al., 2018). The operating assumption of NPDC when developing APERS was that the quality of the educative program and its learning environment serves as the foundation for implementing evidence-based interventions. Thus, a scientifically sound rating scale such as the APERS plays a central part in assessing and developing the learning environment, as an intervention setting (Odom et al., 2013).

Preschool as intervention setting

In Sweden, specialized preschools with self-contained groups for children with special needs are rare. Rather, pedagogical services in mainstream preschools provided with overall high quality are regarded as the best kind of support for children with special needs, and sometimes considered the intervention per se (Sandberg et al., 2010). Children with special needs who receive special intervention (i.e., not just regular preschool provision) do however primarily receive such intervention in their mainstream preschool setting. The intervention is typically provided as consultation from the community resource team (i.e., special education teachers, psychologists, or speech therapists from children's habilitation services or equivalent) (Sandberg et al., 2010).

This model is in line with inclusion as being a cornerstone of the Swedish preschool. However, research to date suggests that the Swedish preschool may be challenging for children with special needs, including children with ASD (Granlund et al., 2016; Långh et al., 2017; Roll-Pettersson et al., 2016; Skolinspektionen, 2017; Zakirova-Engstrand & Roll-Pettersson, 2014). For example, the Swedish preschool is considered to differ substantially from preschools in other parts of Europe and the U.S., as much more time is spent in "free play", and other activities that are not adult-initiated. Such non-structured activities have been found to correlate with special needs children being less engaged, demonstrating more off-task behavior, and obtaining less support from preschool staff (Granlund et al., 2016). Furthermore, in a report from 2017 by the Swedish School Inspectorate (Skolinspektionen, 2017), only 12 of 35 randomly selected preschools were found to provide adequate support for children with special needs. The other 23 preschools typically lacked systematic ways of assessing and analyzing children's needs. Sometimes support was provided, however not based on any form of initial analysis. Furthermore, preschools did not document, monitor nor evaluate the support they provided. The Swedish School Inspectorate also identified that preschool staff did not have a common understanding of how to define "special needs", nor how to provide support. Some preschool staff denied that children with special needs exist, and preferred to say that all children receive more or less support. The authors conclude that Swedish preschool principals need to ensure and support further professionalization among staff, who often lack knowledge and practical skills. The Swedish School Inspectorate suggests that this could be done by providing more consultation and supervision from external experts, by providing time to reflect on how to implement curriculum and guidelines in the daily preschool routines, and by collaboratively discussing how special support should be defined and provided in the preschool setting.

For children with ASD in specific, several barriers for delivery of early intervention have been identified within the Swedish context. In an ethnographic case study by Roll-Pettersson et al. (2016) on EIBI implementation in the Swedish preschool, the authors found that the paraprofessionals who received supervision from habilitation supervisors in implementing EIBI programs became isolated, with very limited involvement of other preschool staff in the planning, implementation, documenting and evaluation of the special support (i.e., EIBI) provided, which may limit autistic children's participation in preschool activities with other children. The authors also found that interviewed parents to

autistic children, as well as habilitation supervisors and preschool staff, identified the lack of knowledge and competency among preschool staff working with children with ASD as a major concern. Also, epistemological differences as well as turf- and loyalty issues were identified between habilitation and preschool, where staff from the two different forms of organizations had dissimilar understandings of both ASD and early intervention. The authors suggest that the differences may be due to differing guidelines between habilitation and preschool. The authors also conclude that the differences negatively influence the collaboration between preschool and habilitation, which may subsequently limit EIBI outcomes.

The findings from the study conducted by Roll-Pettersson et al. (2016) are in line with those of Westman Andersson et al. (2017), who in a qualitative study identified a need for coordination of support for children with ASD and their families, including much-improved collaboration between habilitation and preschool in Sweden. The findings are also in line those of Zakirova-Engstrand and Roll-Pettersson (2014) who found that preschool teachers in mainstream preschool settings tend to rate negative to neutral attitudes towards inclusion of children with ASD, and those of Långh et al. (2017) who identified a lack of knowledge about EBPs for children with ASD, and lack of allegiance towards EIBI.

It may thus as noted by Eldevik et al. (2012), Fixsen et al. (2009), and Odom et al. (2019) be difficult to implement evidence-based programs such as EIBI in poor quality preschool learning environments, where staff lack experience, formal training in how to support children with ASD, as well positive attitudes towards EIBI and inclusion. Taken together, such environmental factors may negatively influence intervention quality, inclusion, children's engagement, children's learning, developmental trajectories, and long-term outcomes for children with ASD (Zakirova-Engstrand & Roll-Pettersson, 2014; Klintwall et al., 2012; Skolinspektionen, 2017).

As previously noted, the APERS has been developed to address similar environmental challenges in the U.S. American educational context. In the theory of change by the NPDC, APERS plays a central part in successful implementation of the behavioral EBPs found within the EIBI framework. By specifically addressing and improving the preschool- or school program quality for autistic children as measured by the APERS, optimal conditions may be established to implement early intervention that produces positive outcomes (Odom et al., 2013). Thus,

by "setting the stage" (i.e., addressing structure, organization, social climate, assessment, content related to instructional practices, as well as teaming and family participation), and by providing relevant, individualized, and evidence-based instruction through the process of on-site coaching, these features combined contribute to a cumulative preschool- or school program experience for children with ASD, defined as overall program quality (Odom et al., 2018).

Based on their theory of change, with the support of APERS, and information about EBPs from systematic reviews (Wong et al., 2015), the NPDC has developed a competency-based model for professional development. The competency-based model includes three full days of in-service training on content such as ASD, goal scaling, and EBPs, and weekly on-site coaching (Kucharczyk et al., 2012). The on-site coaching applied can be described as a sort of embedded professional development for educational professionals, entailing the coach and the inviting partner or partners (Gentry et al., 2008). It is relationship-based, and a key ingredient for successful and sustainable implementation of EBPs (Dunst et al., 2010; Fixsen et al., 2009; Metz et al., 2015). Through the process of coaching, educators are provided with the possibility to work with and reflect on how their behaviors impact children's learning, thus helping the educators to make informed decisions about program organization and instruction (Kucharczyk et al., 2012). Using the in-service training, and the additional on-site coaching supported by initial APERS ratings, NPDC's competency-based model has been applied in 12 states in the U.S., across 132 different preschool and school intervention programs for autistic children, to improve the learning environment in preschool- and school settings.

The model was first evaluated in 2013, based on implementation during the three school years between 2008-2011, in 58 school programs (12 preschools, 23 elementary, 12 middle, and 11 high schools), including 142 autistic students located in nine different states in the U.S. In the evaluation, the NPDC found significant improvements in important program areas such as curriculum and instruction, teaming, structure and set-up of environment, staff's use of EBPs, and children's goal attainment. Thus, positive outcomes were identified on contextual outcomes (i.e., as measured with APERS), with large effect sizes for change across the year in total APERS scores for both preschool- and elementary programs (Cohen's $d = 1.28$), and middle- and high school programs ($d = 1.10$), but also for preschool staff's and autistic children's individual outcomes, with a significant increased mean number

of EBPs used among practitioners (d = 1.35), and the majority of students either meeting or exceeding their identified goals. However, no control group was used to contrast findings with services as usual (SAU; Odom et al., 2013).

The NPDC competency-based model has also been recently evaluated in 60 public elementary schools in one state in the U.S., with 486 participating autistic students, using a randomized controlled design. The authors identified greater improvements of program quality in the NPDC school programs compared with the schools in the SAU condition (Hedge's g = 0.81), albeit not statistically significant. However, further analysis showed that for the subset of inclusive programs, and in contrast to the special education programs, a significant group by time interaction was identified. Furthermore, teachers in the NPDC condition reported significantly higher use and confidence in using EBPs, compared to the SAU condition. Also, autistic children in the NPDC condition showed higher individual goal attainment compared to the SAU condition (g = 0.70), although no significant differences were found between the groups on standardized assessment outcomes (Sam et al., 2020a).

To summarize, the Swedish preschool differs in some aspects from other international early intervention contexts such as the U.S. American. Most notably, preschool implementation of early intervention is almost always supervised by external habilitation centers with different and sometimes contradictive guidelines and epistemological standpoints in, comparison to the educational sector. Yet, the preschool, and thus the municipality, is responsible for the actual implementation, and the surrounding learning environment. Furthermore, research suggests that there is a need to improve the learning environment for children with ASD, that preschool staff lack knowledge about ASD as well evidence-based interventions for children with ASD, which may severely limit the impact of EIBI supervision, fidelity of implementation, and thereby child outcomes. In addition, the habilitation centers which are specialized in young children with ASD and evidence-based early intervention are with the exception of individual directed supervision of preschool paraprofessionals in EIBI programs not responsible for the knowledge and skills among staff, nor any other quality features of the learning environment for children with ASD. In the U.S., the APERS has been successfully developed, psychometrically validated, and used to assess and promote preschool- and school learning environment for children with ASD, to optimize prerequisites for successful early inter-

vention. Thus, the scale has shown promise for international adaptations, cross-cultural validation, and evaluation, and may potentially be well suited to help preschools meet the needs of the growing population of young children diagnosed with ASD in Sweden, including children who receive EIBI.

Theoretical framework

A bio-ecological perspective on autistic children's development and early intervention in the Swedish support system

In systems theory, different parts of a system are understood by exploring how they interact with each other. Thus, by not only studying different levels or parts but also the way they interact, a greater understanding of the system as a whole can be gained (von Bertalanffy, 1968). In Bronfenbrenner's widely used ecological systems theory (Bronfenbrenner, 1979), a systems theory approach is applied to children's development. In the original theory from 1979, the child is placed in the center, and the development of the child is understood through exploring its interaction with decisive environmental factors on multiple system levels. Closest to the center and thus the child, one finds the *microsystem* which has a direct influence on child development, encompassing the child's interaction and relationships with family (parents, siblings, etc.), preschool (preschool staff, peers, etc.), and such. In the *mesosystem*, one finds the interaction between the different systems within the *microsystem*. In the *exosystem*, one finds the surrounding local community. Finally, comprising all other systems, one finds the *macrosystem,* consisting of society and its culture, policies, attitudes, economy, etc. (Bronfenbrenner, 1979). However, the theory was revised by Bronfenbrenner in 2005 (Bronfenbrenner, 2005), adding the importance of the individual child's biological prerequisites, and a temporal dimension including individual maturation as well as societal and cultural change (*chronosystem*). Thus, according to the theory, children's development should be understood through the interaction of individual and environmental factors, over time.

Applying Bronfenbrenner's ecological systems theory to the current thesis, and thus the Swedish context of early intervention, preschool, and ASD, autistic children's development is occurring within a series of nested systems, where each system is embedded in a larger

setting. Using the metaphor of opening up a Russian nesting doll, layer and layer of indirect influence over autistic children's development transforms into direct influence, in the immediate environment (Hauser & Gill, 2017; Odom et al., 2004).

In the *macrosystem,* it translates to society's view of education, preschool, disability, early intervention, inclusion, and participation. It translates to how authorities, professionals, and diagnostic manuals define and regard ASD. It also translates to the contents of the national curriculum (Skolverket, 2018), the national EIBI guidelines (FHS, 2012), and the national education act (2010:800).

In the *exosystem*, it translates to regional guidelines and practices including those of local habilitation centers and their staff. It also translates to local municipalities and their economic resources, internal guidelines about ASD, special support, early intervention, and EIBI. Furthermore, it may also translate to larger preschool units and their own pedagogical orientation, approach, and values. Also included are institutes of higher education, content in preschool teacher higher education, and requirements to function as a supervisor.

In the *mesosystem*, it translates to the engagement, overlap, and collaboration between stakeholders including preschool teachers and principals, habilitation supervisors, families, and other professionals.

In the *microsystem*, it translates to the implementation of individual preschools' pedagogical profiles in the actual preschool settings. It translates to the habilitation supervisors who are supervising EIBI programs, and to the knowledge and skills of individual preschool staff. It translates to environmental arrangements, group sizes, and how support is provided to promote autistic children's interaction with typically developed peers. It also translates to how and what instructions are provided, adapted to the specific preschool settings.

Thus to summarize, for children with ASD who receive EIBI in community-based preschool settings in Sweden, the micro-systems directly influence the child's development through interaction with peers, preschool staff, parents, and sometimes habilitation supervisors while other surrounding systems indirectly affects the child through professional collaboration, organizational structures and policies, and cultural values (Odom et al., 1996).

Summary and conclusion

ASD is a neurodevelopmental condition defined by impairments in communication and social interaction, repetitive, stereotypical behaviors, and restricted interests. ASD is often associated with additional difficulties and challenges. More and more children are diagnosed with ASD, at a younger age. This places increased demands on habilitation services and preschools to meet the needs of these children. Research during the last decades has developed and evaluated instructions and methods based on the principles of ABA, which have been applied and systematically evaluated within EIBI programs for young children with ASD. EIBI has been found to benefit children with ASD, although more research is needed to understand variability in response, and how gains are maintained over time. Based on current research, the Swedish habilitation EIBI recommendations propose 25 hours of weekly intervention, for a duration of at least two years, supervised by habilitation supervisors, and implemented in mainly preschool settings. These preschool settings are in Sweden almost always inclusive groups. However, research to date indicates that the learning environment in mainstream preschool settings in Sweden is typically not well adapted to the needs of autistic children. This may negatively affect the implementation and outcomes of EIBI programs, and subsequently negatively influence the participation and development of autistic children, as well as their families. There is thus a need to apply a broader focus on early intervention for children with ASD in inclusive preschool settings, by evaluating and improving learning environment quality. Such research has been conducted in the U.S. with promising results, but very limited research exists in Sweden within the context of early intervention and preschool learning environment quality for children with ASD. To analyze implementation context as well as results, systems theory may be used.

Aims of the thesis

Overall aim

The overall aim of this thesis is to study and highlight the importance of preschool learning environment quality for children with ASD in Sweden who receive EIBI by translating and culturally adapting the Swedish version of the APERS-PE, and evaluating the use of APERS-

P-SE in addition to EIBI to promote preschool program quality for children with ASD, as well as children's and staff's outcomes. An additional aim was to explore stakeholders' perspectives on preschool program quality for autistic children who are receiving EIBI and their experience of receiving the APERS-P-SE-based intervention model.

Aims of the research studies

Study 1

The aim of this study was to translate APERS-PE to Swedish, culturally adapt the contents to fit with the Swedish educational- and support system, and to assess the scale's content validity with the help of various professionals with expertise within the field of early intervention, ASD, preschool, special education and habilitation in Sweden.

Study 2

The aim of this study was to evaluate the effect of using APERS-P-SE to improve preschool program quality for preschool children with ASD who were receiving EIBI from a centralized habilitation center. We hypothesized that providing feedback, applying in-service training and on-site coaching based on APERS-P-SE assessment in addition to EIBI would be superior to using EIBI only for both primary (i.e., preschool learning environment quality for children with ASD) and secondary (i.e., outcome measures for children and preschool staff) outcomes.

Study 3

The purpose of this study was to explore what parents, preschool staff, preschool principals, and habilitation supervisors perceived as most important for children with ASD in preschool receiving EIBI, and whether participating in the APERS-P-SE-based intervention had affected the quality of the learning environment for the autistic children who had participated in study 2.

Methods

Methodological overview

The research comprised in this thesis were all empirical studies, with different research designs, including the collection of both quantitative and qualitative data. Participants were preschools, children with ASD, parents to children with ASD, preschool staff working with children with ASD, preschool principals, habilitation supervisors providing EIBI supervision, and experts within the field of ASD, early intervention, preschool, special education, and habilitation. Table 2 provides an overview of the research designs, participants, and methodological approaches that were used in each of the three studies.

Table 2. Description of studies, number of participants, instruments, design and data analysis.

Study	Title	Participants	Instruments	Design	Data analysis procedures
I.	Cross-Cultural Content Validity of the Autism Program Environment Rating Scale in Sweden	Expert raters (*n*=9)	APERS-P-SE	Psychometric evaluation of content validity	Content validity assessment
II.	Adapting the Preschool Environment to the Needs of Children on the Autism Spectrum in Sweden: A quasi-experimental study	Preschools (*n*=17) Children with ASD (*n*=17) Preschool staff (*n*=35)	APERS-P-SE, EVA, EBP-Q, AKQ, SESSQ, CGI-AUT, Vineland-II, CEQ, GAS, SVS	Quasi-experimental, nonequivalent pretest-posttest group design	Intraclass correlation, Pearson correlation, Student's t tests, two-factor mixed-design ANCOVA, MANCOVA, and MANOVA

III.	*From Someone Who May Cause Trouble to Someone You Can Play With*: Stakeholders' Perspectives on Preschool Program Quality for Autistic Children	Preschool teachers (*n*=2) Paraprofessionals (*n*=2) Preschool principals (*n*=2) Parents of three children with ASD (*n*=4) EIBI supervisors from habilitation center (*n*=9)	Semi-structured interviews (interview guides).	Qualitative exploration of stakeholders' perspectives and experiences	Thematic analysis; Triangulation, Matrix analysis, Inductive Thematic Saturation Analysis

Study 1

Instrument

The original APERS-PE is designed to assess the learning environment of children with ASD in preschool or elementary school (Odom et al., 2018). It is a scale that consists of 59 items, scored on a 5-point Likert scale, ranging from 1 (*poor quality*) to 5 (*high quality*). The items are grouped into 10 domains: Learning Environments, Positive Learning Climate, Assessment and Individual Education Plan (IEP) Development, Curriculum and Instructions, Communication, Social Competence, Personal Independence and Competence, Functional Behavior, Family Involvement, and Teaming. The scale yields a global score for the overall program quality, but also separate scores for individual items and domains. It can be used to assess both inclusive and self-contained teaching environments, as a baseline measure of program quality, to plan interventions, and to follow-up and evaluate potential changes in program quality. The scale requires that the raters have expertise on ASD and have obtained specific training on administering the scale. The APERS-PE assessment usually requires about 6-7 hours to administer. Information is gathered through observations, field notes, reviews of IEPs, and interviews with teachers and parents. The information is then combined by the rater, to assess individual items, for example concerning transitions within settings and activities in the preschools. For the psychometric properties of APERS-PE Odom et al. (2018) reported high internal consistency (Cronbach's Alphas $r = .94$) for the total scale

and moderate consistency for subdomains (Cronbach's Alphas averaging $r = .70$). An exploratory principal component analysis demonstrated that APERS items mainly loaded on a single factor, that could be interpreted as program quality. The instrument also showed sensitivity to improvements in program quality, following the implementation of the previously described systematic model of professional development to teachers in preschools and schools with autistic students.

Procedures and participants

In study 1, the research team translated and culturally adapted APERS-PE to its Swedish version (APERS-P-SE) in a stepwise procedure. Subsequently, various experts within the field of early intervention, ASD, ABA, EIBI, habilitation, and preschool from different organizations such as habilitation services, preschools, the National Agency for Special Needs Education and Schools, and universities, were invited to assess the content validity of the translated, revised and culturally adapted scale. In total, 9 experts participated and provided their ratings on the clarity and comprehensiveness of the scale's items, and relevance for the scale's subdomains and domains, on a 4-point Likert scale ranging from 0 (no clarity/comprehensiveness/ relevance) to 3 (full clarity/comprehensiveness/relevance), along with written formative feedback. Furthermore, the experts provided their ratings on overall beliefs about APERS-P-SE's usefulness, relevance, necessity, need, practical use, and personal preference, using the same Likert scale.

Data analysis

A Content Validity Index (CVI; Davis, 1992; Lynn, 1986; Rubio et al., 2003; Sousa & Rojjanasrirat, 2011) was used to assess the scale's content validity. The CVI was calculated based on the experts' ratings. First, CVI was assessed on item level by counting the number of experts who rated the items' level of clarity and comprehensiveness as "2" or "3", divided by the total number of experts. Secondly, CVI was calculated for the subdomains' relevance for their superordinate domains, and the domains' relevance for the scale as a whole, by counting the number of experts who rated the subdomains/domains relevance as "2" or "3", divided by the total number of experts. Adhering to the guidelines by Lynn (1986), a CVI threshold of $\geq .78$ (a minimum of seven out of nine raters scoring item/subdomain/domain as "2" or "3") was applied. Additionally, mean ratings were calculated for experts' ratings

about the scale in its entirety (i.e., usefulness, necessity, etc.) by dividing the total score of each of the six statements by the total number of experts.

Study 2

Study design

This study was pre-registered with the U.S. National Institutes of Health (ClinicalTrials.gov; #NCT03634761). It applied a nonequivalent pretest-posttest design (Portney & Watkins, 2015). At three different time points, over a total of three cohorts, preschools/EIBI intervention sites (with one child with ASD receiving EIBI in each preschool) were assigned to either the experimental (EIBI/APERS-P-SE preschools) or control group (EIBI only). The EIBI/APERS-P-SE preschools group received EIBI plus APERS-P-SE-based feedback, in-service training, and on-site coaching. The EIBI only group received EIBI and APERS-P-SE-based feedback only. The cohorts were recruited in Stockholm County, Sweden, between September 2017 and May 2019. The first cohort of preschools (k = 6) was non-randomly allocated into the experimental and control group to ensure comparability regarding (i) supervisors' experience of supervising EIBI programs, (ii) APERS-P-SE determined level of preschool environment quality, and (iii) children's adaptive behavior (Vineland Adaptive Behavior Scales-II ratings; Sparrow et al., 2015) scores at baseline. For practical reasons, the second and third cohort (k = 11) were divided into matched pairs based on supervisor experience, and with each pair randomized to either the EIBI/APERS-P-SE group or the EIBI only group by two members of the research team using a digital randomization tool. Neither participants nor the research team were blind to group allocation. For each cohort of participants, the total extent of the intervention was approximately 8 months.

Participants

Inclusion criteria

The study comprised children with ASD, preschools, and preschool staff working directly with autistic children. Inclusion criteria for children were: age 2 to 5 years, a documented community diagnosis of

ASD, and a recent enrollment in an EIBI preschool program supervised by a habilitation center specialized in young children with ASD. The inclusion criterion for preschools was to have a child fulfilling the abovementioned criteria in one of their preschool groups. The inclusion criterion for participating preschool staff was to work in the same preschool group as one of the participating children. The exclusion criterion was for the children to have an EIBI supervisor previously or currently engaged in the research study, to make sure that no supervisor supervised EIBI programs in both group contingencies.

Recruitment

In the context of a supervision meeting at the habilitation center, parents to children meeting criteria were informed about the study. Following informed consent, preschool principals were contacted and provided with information about the study. Following informed consent, one or two members of the research team informed preschool staff about the study and collected informed consent from staff. A total of 52 individuals participated, across 17 different preschools/EIBI intervention sites. In total, 17 children (2 girls and 15 boys) with ASD participated, along with 35 associated preschool staff, served by one habilitation supervisor for each preschool (see Figure 1).

Participating children

Children were aged between 3 and 5 years by the onset of study. The mean age in both study conditions was 4.8 years. All participating children had an ASD diagnosis from the Child and Adolescent Mental Health Services in Stockholm, provided by multidisciplinary assessment teams consisting of psychiatrists, psychologistsm and sometimes other professions such as occupational therapists, speech-language pathologists, and social workers. Regional clinical guidelines for the assessment and treatment of ASD were used (Stockholms läns landsting & Barn- och ungdomspsykiatri, 2015), as well as ICD-10 criteria (WHO, 1992). Four out of 17 children had received an additional neurodevelopmental diagnosis (i.e., intellectual disability, speech disorder, or ADHD). All children in the study attended inclusive and mainstream community-based preschools, except for one child in the EIBI only group who attended a special education group for children with disabilities in a community-based preschool.

Participating preschools

The participating preschools were located in different parts of Stockholm County and represented a diversity of socio-economic conditions. A limited number of preschools had specific pedagogical profiles such as "Reggio Emilia-inspired". The majority of preschools did however not have any defined pedagogical profile except for following the national Swedish curriculum (Skolverket, 2018). Nine out of the 17 preschools were municipal preschools, while the other eight preschools were publicly funded independent preschools.

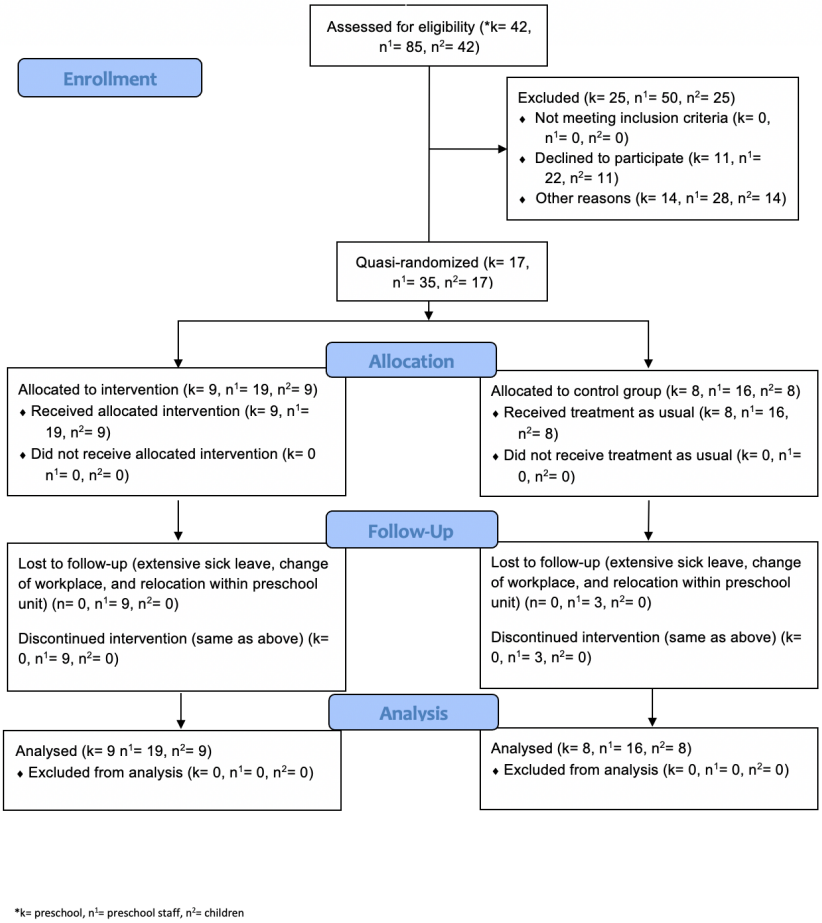
Participating preschool staff

Preschool staff had various educational backgrounds. A minority (34%) had a formal preschool teacher education. The majority of the preschools staff in the study had worked in preschools for more than 5 years before the study commenced, and almost all participating staff had known the child with ASD receiving EIBI for at least 6 months.

Participating habilitation supervisors

The EIBI supervisors connected to the study had different professional backgrounds. Four were psychologists, 10 were speech-language pathologists, and three were special educators. Before the onset of the study, only a minority of the supervisors had supervised more than two previous EIBI programs, while the majority had very limited experience of EIBI supervision.

Figure 1. Consort flow diagram



Procedure

EIBI only and EIBI/APERS-P-SE preschools

APERS-P-SE was used to assess the strengths and weaknesses of all preschool learning environments. Inter-rater reliability was evaluated for 21% of the assessments applying a two-way, absolute agreement, single-measure intraclass correlation (ICC; Hallgren, 2012; McGraw & Wong, 1996), indicating good reliability (r_{ICC} = .77, p < .001, 95% CI [.72, .81]). Based on APERS-P-SE assessments verbal and written feedback was provided to preschool staff in all preschools prior to group allocation, on areas of strengths and weaknesses, to support the improvement of the learning environment for children with ASD. In both groups, EIBI supervision was provided to preschools as usual during

the eight months long APERS-P-SE-based intervention. The supervision was provided weekly or bi-weekly at the habilitation center. Occasionally, habilitation staff traveled to preschools to provide supervision to preschool staff and parents. The EIBI programs focused mainly on children's functioning, learning, and development, and were implemented in children's preschools and homes. On average, the EIBI/APERS-P-SE preschools received 18.22 supervision sessions during the eight months of APERS-P-SE-based intervention, while the EIBI only preschools received 17.25 supervision sessions.

Most of the participating children were in a group with 3 to 5-years old children, with an average of about 18 children in each group, and a staff-to-child ratio of slightly less than 4 children per preschool staff. All children receiving EIBI had an assigned paraprofessional to implement the EIBI program.

Less EIBI implementation time (18.28 h/week) than the recommended 25 hours of weekly intervention was reported across all preschools in both of the study's groups. Most part of the intervention was provided in the preschool (12.23 h/week). The EIBI only preschools and the EIBI/APERS-P-SE preschools did not differ significantly in regard to supervisors' experience in supervising EIBI programs, number of supervision sessions, or reported EIBI implementation time.

EIBI/APERS-P-SE preschools

Following group allocation, and to build a learning environment-focused intervention based on APERS-P-SE assessments, in-service training to preschool staff (paraprofessionals and preschool teachers) and on-site coaching on the use of selected EBPs for children with ASD was provided to the EIBI/APERS-P-SE preschools, derived from the initial APERS-P-SE results. To promote preschool learning environment quality for autistic children, as well as individual goal attainment, the selected EBPs included reinforcement (Sam et al., 2020), time delay (Sam et al., 2020b), visual supports (Sam & AFIRM Team, 2015b), structured play groups (Sam et al., 2018), peer-mediated instruction and intervention (Sam & AFIRM Team, 2015a), and naturalistic intervention (Amsbary & AFIRM Team, 2017). All EBPs were based on the EBP framework defined in the comprehensive review by Wong et al. (2015). Thus, focusing on fundamental instructional practices such as reinforcement, as well as prompt-fading (time delay), providing instruction in everyday mainstream activities (naturalistic intervention), adapt-

ing the learning environment and promoting independence (visual supports), and promoting peer interaction and play (structured play groups and peer-mediated instruction and intervention).

Serving the purpose of promoting the development of strengths and reducing weaknesses of the preschool learning environment, and supporting autistic children's goal attainment, this additional support based on APERS-P-SE was provided by habilitation supervisors who already supervised the regular EIBI program of the autistic child. To prepare and train the habilitation supervisors to the study's EIBI/APERS-P-SE preschools, pre-service training was provided at the onset of the study. It consisted of a one-day workshop in the basic tenets of using of APERS-P-SE, coaching procedures, the previously described EBPs for ASD, inclusion, and children's engagement. Additionally, midway through the intervention, the supervisors were also provided with a half-day booster work-shop on inclusive EBPs (i.e., naturalistic intervention, and peer-mediated instruction and intervention), to enhance children's inclusion and engagement. Furthermore, the habilitation supervisors had access to continuous support from the research team during the study, in how to translate the results from the APERS-P-SE ratings into best possible practice.

In the EIBI/APERS-P-SE preschools group, first, one day of in-service training was provided to a minimum of two preschool staff from each preschool. The in-service training targeted the abovementioned EBPs for children with ASD, features of a high-quality learning environment to promote learning, inclusion, and engagement, and goal attainment scaling. Second, monthly, one-hour-long on-site coaching sessions were provided by the habilitation supervisors. The coaching sessions involved one or two of the preschool staff, during a period of about 8 months. The coaching on-site was at times supplemented with coaching via telephone, or in association with a regular EIBI supervision session at the habilitation center. In the coaching sessions, goals were identified, formulated, and scaled based on initial APERS-P-SE feedback. Relevant EBPs were then selected, and implemented in order to promote children's goal attainment and to improve quality features such as the physical set-up of the environment. In each session, following the guidelines by Kucharczyk et al. (2012), a pre-observational meeting was followed by observations, and then a post-observation meeting, supported by the use of implementation checklists. EBPs used included, for example, reinforcement, peer-mediated instruction and intervention, and naturalistic intervention. Children's goals were, for example, to actively engage in circle time, or to independently eat lunch

together with peers. Subsequently, to support children's goals attainment, changes were made in the learning environment, for example by creating physical delineations, adapting group size, contents, and duration of activities, and by implementing visual supports. About midway through the intervention, all participating preschool staff in the EIBI/APERS-P-SE preschools were invited to a half-day seminar, to follow up on their work in the preschools, creating a forum for preschool staff to discuss and reflect on children's progress and the use of EBPs together with members of the research team and each other.

Thus, to summarize, in the EIBI/APERS-P-SE preschools EIBI supervision as usual was supplemented with continuous in-service training to two preschool staff, and monthly on-site coaching to preschool staff, based on the initial APERS-P-SE assessments.

In contrast to EIBI as usual, the specific goals and aims for the on-site coaching in the EIBI/APERS-P-SE preschools were developed in collaboration between habilitation supervisors and preschool staff, and not provided unidirectional by the habilitation supervisor. Furthermore, the additional on-site coaching focused more on improving the learning environment, supporting inclusion and participation for the autistic child, promoting interaction with peers, and creating naturalistic learning occasions, compared to the EIBI program's focus on supporting individual children's skill acquisition.

Treatment fidelity

Dosage

On average, 6.78 (*SD* = 1.48) coaching sessions were provided for each EIBI/APERS-P-SE preschool, with an average of 7.19 hours of coaching (*SD* = 0.97) for each preschool. All EIBI/APERS-P-SE preschools received APERS-P-SE feedback and attended preparatory in-service training, and the follow-up seminar.

Integrity

Questionnaires describing habilitation supervisors' latest on-site coaching were completed in connection with a total of 24 coaching sessions, at different time points during the study, across all supervisors. Average ratings were 4.00 (*SD* = 1.17) for "I followed the coaching procedure (pre-observation conference, observation, and post-observation conference), 4.65 (*SD* = 0.92) for "I perceived the preschool staff as engaged in the coaching session", 4.25 (*SD* = 1.07) for "The coaching session proceeded without any major disruptions or incidents", 4.63 (*SD* = 0.82)

for “The coaching session focused on one or more APERS-goals”, and finally 4.58 (*SD* = 0.72) for “I perceived the coaching session as helpful for the preschool staff in their work”.

Attrition and adverse effects

12 out of 35 preschool staff left their preschool groups during the intervention, whereof nine staff pertained to the EIBI/APERS-P-SE preschools, and the remaining three to the EIBI only preschools. Reasons for attrition included extensive sick leave and change of workplace, however, no attrition appeared to be related to the study. Preschool staff who left their preschools were replaced and the replacements received on-site coaching if possible. There was no attrition among children or preschools, and no adverse events were reported.

Outcome measures

Primary outcome measure

Autism Program Environment Rating Scale - Preschool - Sweden (APERS-P-SE). This scale is designed to examine the preschool learning environment of children with ASD in Swedish preschools. It is the translated and culturally adapted Swedish version of the original APERS (Odom et al., 2018). It consists of 56 items scored on a 5-point Likert scale ranging from *poor quality* (1) to *high quality* (5), grouped into 33 subdomains which in turn forms 10 domains.

Secondary outcome measures

Clinical Global Impression - Autism (CGI-AUT). An instrument designed to assess the symptom severity of preschool-age children with ASD rated on a scale between 1 and 7 (1 = *no autism symptoms*, 7 = *maximum symptom severity*), based on the original scale by the OSU Research Unit on Pediatric Psychopharmacology (2005). It has previously been translated, validated, and used in a Swedish context (Choque Olsson & Bölte, 2014).

Vineland Adaptive Behavior Scales - Second Edition (Vineland-II) - Teacher ratings. A scale designed to assess children’s adaptive behaviors within various domains such as Independence and Communication skills (Sparrow et al., 2015). It is rated on a 3-point Likert scale (0 = *never occurs*, 2 = *occurs often*). The scale is translated to Swedish and cross-culturally validated, but raw data are not normalized

for the teacher ratings. In the current study, all domains are rated except for the motor skills domain.

Children's Engagement Questionnaire (CEQ). A scale designed to assess children's level of engagement in various situations (McWilliam, 1991). It consists in its current form of 29 items/situations, rated on a 4-point Likert scale (1 = *not at all typical*, 4 = *very typical*). The scale has previously been translated, used, and validated in Sweden (Almqvist, 2006; Lillvist, 2010). In the current study, one version is rated by preschool staff about the level of children's engagement in the preschool setting, and another version is rated by parents about the level of children's engagement in the same situations outside of the preschool setting (e.g., at home).

Ethics, Values and Allegiance (EVA). This is a scale designed for preschool staff to assess allegiance toward EIBI for children with ASD (Klintwall et al., 2012; Långh et al., 2017). It consists in the current study of 11 statements about common prejudices and criticisms towards EIBI. All statements are rated on a 5-point Likert scale ranging from 0 (*I completely agree*) to 4 (*I do not agree*).

Evidence-Based Practices Questionnaire (EBP-Q). This is a questionnaire designed for preschool staff to self-assess knowledge about, use of, and implementation skills of 15 different EBPs for children with ASD, on a 4-point Likert-scale ranging from 0 (*not at all*/*never*/*not at all*) to 4 (*very well*/*very often*/*completely*). The 15 EBPs were chosen from the 27 evidence-based practices identified by Odom et al. (2013), and Hall (2015), because of their relevance for working with preschool-age children in preschool settings. The questionnaire is translated from its original English version.

Autism Knowledge Questionnaire (AKQ). This is a questionnaire designed to assess preschool staff's knowledge about ASD. It contains 18 statements about ASD which can be rated as "*true*", "*false*", or "*I don't know*". Examples of statements include "All children with ASD are uninterested in playing with other children". The questionnaire is a revised edition of an earlier version used in a study on knowledge about ASD among grandparents to children with ASD receiving education at a habilitation center (Zakirova-Engstrand et al., 2021).

Self-Efficacy, Stress and Satisfaction Questionnaire (SESSQ). This is a 6-point Likert-scale (0 = *I do not agree at all*/*no stress*/*not at*

all/*I do not agree at all*, 5 = *I completely agree*/*extreme stress*/*very much*/*completely*/*I completely agree*) designed to assess perceived levels of stress, general self-efficacy, self-efficacy for working with children with ASD, and work satisfaction, among preschool teachers, paraprofessionals, and other preschool staff. It contains the translated short version of Tschannen-Moran and Woolfolk Hoy's (2001) Teacher Efficacy Scale, a translated and abbreviated version of the Autism Self-Efficacy Scale for Teachers (ASSET; Ruble et al., 2013), as well as a selection of translated items from the Job Satisfaction Survey (Spector, 1985), and the Teacher Stress Inventory (Boyle et al., 1995). The scale comprises a total of 34 statements, whereof 12 are about self-efficacy in general within the preschool context, 14 are about self-efficacy specifically for working with children with ASD, five are about stress and three are about work satisfaction.

Other measures (used solely in the EIBI/APERS-P-SE preschools)

Goal Attainment Scale (GAS). An ordinal scale designed to assess the level of goal attainment for participating children in the study's experimental group rated from *baseline* (0), *meets initial objective* (1), *meets secondary objective* (2), *meets annual goal* (3), *exceeds annual goal* (4). Originally designed to be used for the treatment of psychiatric disorders (Kiresuk & Sherman, 1968), it is now used in a broad field of areas. The scale has been translated to Swedish, and goals are decided upon in collaboration between participating preschool staff and supervisors, and children's parents.

Social Validity Scale (SVS). A 6-point Likert scale (0 = *I do not agree at all*, 5 = *I completely agree*) developed within the current study and thesis. It is designed for preschool staff in the experimental group to assess the relevance and meaningfulness of the goals targeted within the study, the methods used, the feedback provided by the research team, the content of the in-service training and coaching, and the future usefulness of the knowledge and skills acquired when working with other children in the future.

Data analysis

All data analysis was conducted according to intention-to-treat principles (McCoy, 2017). Partial eta squared was used to compute all effect sizes.

Student's t-tests were applied to assess if the two groups differed at baseline condition. The EIBI only group rated higher work-related stress (SESSQ-Stress; p = .004), lower work-related satisfaction (SESSQ-Satisfaction; p = .04), and lower allegiance towards EIBI (EVA; p = .007) in comparison to the EIBI/APERS-P-SE preschools group at baseline. Thus, SESSQ-Stress, SESSQ-Satisfaction, and EVA were correlated with primary and secondary outcomes to ensure that these variables did not confound with the effects of the APERS-P-SE-based intervention. For our main outcome, we found that EVA had a moderate positive correlation with APERS-P-SE total score at follow-up (r = .49; p = .045). Furthermore, for our secondary outcomes, we identified that EVA, SESSQ-Stress, and SESSQ-Satisfaction correlated with some of the APERS-P-SE domains. Thus, the influence of EVA was covaried for in the analysis of APERS-P-SE, and the influence of EVA, SESSQ-Stress, and SESSQ-Satisfaction was covaried for in the analyses of the domain scores of APERS-P-SE.

A two-factor mixed-design analysis of covariance (ANCOVA; Portney & Watkins, 2015) with APERS-P-SE total score as the dependent variable was used to investigate APERS-P-SE-based intervention changes between pre and post-measures, with an alpha level of p = .05. To investigate changes in APERS-P-SE domain scores between pre- and post-measures, a two-factor mixed-design multivariate analysis of covariance (MANCOVA; Huberty & Petoskey, 2000) was used with APERS-P-SE domain scores as the dependent variable, and time and group condition as independent variables. For all univariate outcomes, a Bonferroni corrected alpha level of p = .005 was applied.

For our exploratory secondary outcomes on *child* level, a two-factor mixed-design multivariate analysis of variance (MANOVA; Portney & Watkins, 2015) over all dependent variables (Vineland-II, CGI-AUT, CEQ-Preschool, CEQ-Parent) was used, with time and group condition as independent variables.

For our exploratory secondary outcomes on *preschool staff* level, a two-factor mixed-design MANOVA over all dependent variables (EBP-Q, EVA, AKQ, SESSQ*)* was used, with time and group condition as independent variables.

All statistical assumptions were not met for the MANOVAs and the MANCOVA conducted. In the MANCOVA applied for the APERS-P-SE domains, the number of dependent variables (10) exceeded the sample sizes (9 and 8). Additionally, not all dependent var-

iables were normally distributed. Even so, F-tests are robust to violations of non-normality in data (Blanca et al., 2017; Schmider et al., 2010).

In addition, paired t-tests were used over all outcome measures to explore within-group changes, with Bonferroni corrected alpha levels of $p = .005$ for the APERS-P-SE domains. For all statistical analyses, SPSS Statistics (IBM Corp, 2019) was used.

Study 3

Recruitment and participants

Participants were recruited in connection with the termination of the APERS-P-SE-based intervention described in Study 2. The majority of the participants were recruited from the first cohort of the study, with the exception of habilitation supervisors who were recruited from all three cohorts to provide a heterogeneous set of experiences with EIBI supervision. The first cohort entailed stakeholders (preschool staff, preschool principals, parents to children with ASD, and habilitation supervisors) connected to three preschool programs. From this cohort, a total of 13 interviews were performed with 14 individuals including four preschool staff, two preschool principals, four parents to children with ASD, and four habilitation supervisors. Additionally, one individual interview and a focus-group interview was conducted with five habilitation supervisors from cohort 2 and 3. Thus, a total of 19 individuals were interviewed. Participating parents could choose if both parents were to be interviewed, or not. In one of three interviews with parents, both parents participated. No economical compensation was provided to the participants.

Interview guides

Four semi-structured interview guides were produced to match each group of participating stakeholders. The guides contained questions about (i) important aspects of Swedish preschool program learning environment for autistic children receiving EIBI, and (ii) how the stakeholders had perceived the APERS-P-SE-based intervention, with pertaining follow-up questions and probes.

Design and procedure

A qualitative design was used (Patton, 2015) to explore the experiences and perspectives of the different stakeholder groups. All interviews were conducted when post-data was collected for study 2. Thus, between May and June 2018 for the first cohort, and in June 2019 with the additional habilitation supervisors. All interviewers had previous experience in the field of preschool, ASD, and early intervention, as clinical psychologists, researchers, or both. Duration of interviews varied between 31 and 62 minutes with an average duration of 51 minutes for the habilitation supervisors, 39 minutes for the parents, 57 minutes for the preschool principals, and 50 minutes for the preschool staff. The focus group interview was 56 minutes long.

Data analysis

Interviews were recorded with a digital audio recorder and transcribed verbatim. NVivo 12.0 (QSR International, 2020) was used for coding and additional processing. Thematic analysis (Braun & Clarke, 2006) was used to analyze all verbal data, and a matrix analysis (Miles et al., 2014) was applied to portray themes for the different stakeholder groups.

An inductive approach was applied to answer the study's two research questions. Thus, the transcribed verbal data was analyzed based on the participants' experiences, codes were assigned to segments of text through thorough readings, and concepts and themes were produced (Azungah, 2018).

Following the guidelines outlined by Braun and Clarke (2006) for thematic analysis, and to promote trustworthiness, two members of the research team independently read the interviews thoroughly (however, for ethical reasons, as one of the members of the research team worked as a clinical habilitation supervisor, that member did not read the interviews with the habilitation supervisors). The two research team members generated codes for text units relevant to the research questions, analyzed coded blocks, developed preliminary themes, and developed and named general themes. Subsequently, coders assessed intercoder agreement, re-evaluated identified themes, and finally reached a consensus on themes. Finally, for two-thirds of the interviews with the habilitation supervisors, to further promote the trustworthiness of the findings, the procedure described above was replicated by an additional member of the research team.

An inductive thematic saturation approach was applied to analyze and assess saturation, thus focusing on the lack of construction of new themes or codes in the analysis to indicate saturation (Saunders et al., 2018). An emerging codebook was used to calculate saturation, and data collection was discontinued when no new themes or codes could be identified in the verbal data (Hennink et al., 2017).

Ethical considerations

All studies included in this thesis were conducted according to the Declaration of Helsinki, and have been approved by the Regional Ethical Review Board in Stockholm (2016/2498-31/5). Study 2 was offered as an addition to ordinary clinical intervention. For all participants, it was strongly emphasized that a decision to not participate would not affect the ongoing clinical intervention. The supplementary intervention through the research project was provided for a limited time (about 8 months), and for the on-site coaching often in connection to regular supervision at the preschool. However, the APERS-P-SE-based intervention did require time off from regular tasks for in-service training and pertaining on-site coaching, which could otherwise have been spent in the child group, and may have caused inconvenience. Parents were asked to fulfill one questionnaire which may have caused additional stress, considering that parents to children with ASD often experience more stress than other parents (Rao & Beidel, 2009). The preschools that were assigned to the EIBI only group were offered in-service training after the completion of the study, equivalent to what would have been provided in the EIBI/APERS-P-SE preschools group. For study 3, all participants were informed about the study in connection to the termination of the APERS-P-SE-based intervention and written and oral consent was obtained from all participants.

Results

Results from study 1

All items were rated equal to or above the content validity threshold of .78 for comprehensiveness and clarity. Average CVI for all items' level of clarity was .98, and .97 for all items' level of comprehensiveness. All subdomains were rated as relevant for their superordinate domains, with CVIs ranging from .89 to 1.00. Average CVI for all subdomains was .99. All domains were rated with a CVI of 1.00 for their relevance of the overall program quality for children with ASD in the Swedish preschool.

For the experts' ratings of the six statements concerning the overall relevance of using APERS-P-SE to assess the learning environment for autistic children in Swedish preschool settings, the average score was 2.65, with a range between 2.11 for practical use, and 3.00 for need and lack of previous scale.

The formative feedback indicated that the scale was comprehensive and that it places high demands on preschools. It also indicated that the majority of preschools in Sweden would be considered far from providing a high-quality preschool environment for children with ASD if assessed with APERS-P-SE.

Results from study 2

Preschool learning environment (APERS-P-SE)

For the primary outcome measure, a significantly larger change in APERS-P-SE total score for the EIBI/APERS-P-SE preschools group compared to the EIBI only group ($F = 12.42$; $p = .003$; $\eta^2 = .47$) was indicated in the group by time interaction effect, with a large effect size in favor of the preschool learning environment for autistic children in the EIBI/APERS-P-SE preschools.

For the secondary outcome measures, there was no significant multivariate group by time interaction effect for the APERS-P-SE domain scores. Univariate results demonstrated significant group by time interaction effects for the domains Personal Independence and Competence (F = 12.30; p = .004; η^2 = 0.51) and Learning Environments (F = 14.74; p = .002; η^2 = 0.55), in favor of the EIBI/APERS-P-SE preschools.

Within-group changes indicated significant improvements in APERS-P-SE total score in the EIBI/APERS-P-SE preschools (t [8] = -5.82; p = .001). Furthermore, within-group changes indicated significant improvements for the domains Functional Behavior (t [8] = -4.13; p = 0.003), Curriculum and Instruction (t [8] = -4.27; p = .003), Learning Environments (t [8] = -6.42; p = .001), Social Competence (t [8] = -4.63; p = .002), and Personal Independence and Competence (t [8] = -6.75; p = .001). In the EIBI only group, no significant within-group changes were identified.

Child outcome measures

On child level, no significant multivariate interaction effect of group condition and time was identified, and no significant univariate interaction effects were found. In the EIBI/APERS-P-SE preschools, within-group changes indicated significant improvement for children's adaptive behaviors (Vineland-II; t [8] = -2.48; p = .038). However, in the EIBI only preschools no significant within-group changes were identified. Furthermore, in the EIBI/APERS-P-SE preschools group, GAS progress was made on 89% of the children's goals, and 63% were either met or exceeded. Average level of goal attainment across all children was 2.59 *(SD = 1.42).*

Preschool staff outcome measures

On preschool staff level, no significant multivariate interaction effect of group condition and time was identified, and no significant univariate interaction effects were found. In the EIBI/APERS-P-SE preschools, within-group changes indicated significant improvement for knowledge about, use of, and implementation of evidence-based practices (EBP-Q; t [18] = - 3.61; p = .002). In the EIBI only group, no significant within-group changes were identified. On the SVS, completed by preschool staff in the EIBI/APERS-P-SE preschools following the intervention, average ratings on social validity were 4.8 (SD =

0.42) for in-service training relevance, 4.6 (*SD* = 0.52) for APERS-feedback relevance, 4.7 (*SD* = 0.48) APERS-goals relevance, 4.9 (*SD* = 0.32) for helpfulness of procedures and methods used, and 4.7 (*SD* = 0.67) for usefulness of acquired teaching skills with other children.

Results from study 3

Four themes were identified in the analysis that were common for all stakeholder groups:

- Staff's competence
- Children's inclusion and participation
- Collaboration
- Learning environment

For each theme, at least one segment of pertaining text was coded in all interviews. In general, most coded segments of text were attributed to staff's competence. However, there were differences among the stakeholder groups. For example, preschool principals mainly addressed learning environment, while preschool staff mainly emphasized staff's competence.

Knowledge and skills (i.e., competence) about how to support autistic children in their preschool was described as instrumental for providing a high-quality learning environment for children with ASD receiving EIBI, although this may vary substantially among preschool staff. Over all interviews and stakeholder groups, the APERS-P-SE-based intervention was described as supporting and improving preschool staff's competence, mainly through APERS-P-SE-informed on-site coaching which was described as highly important and helpful. The supervisors described that it provided opportunities to observe the child interact in its natural preschool environment, and that involving several staff members lead to preschool staff feeling more engaged and self-assured and gaining more knowledge. However, for some supervisors, on-site coaching was also described as an unforeseen challenge.

Children's inclusion and participation was described as something desirable and important, albeit challenging to attain. In general,

the APERS-P-SE-based intervention was perceived as helpful to support inclusion and participation, by focusing on how to promote children's engagement, and by using peer-mediated instruction and intervention in inclusive activities.

Additionally, collaboration was discussed by many of the stakeholders as a key ingredient for providing a high-quality preschool program for children with ASD. This entailed collaboration among preschool staff, with parents, and with habilitation supervisors. The APERS-P-SE-based model was perceived as especially helpful for supporting collaboration between preschool staff in how to support children's inclusion and provide instruction.

Lastly, the interviewed stakeholders described the immediate learning environment as crucial, entailing aspects such as using visual supports, adapting the number of children in a group, and providing physical structures and delineations. The APERS-P-SE-based intervention was described as providing support in improving the use of visual supports, in adjusting the number of children in activities, and increasing the amount of time for autistic children in inclusive activities by providing routines, support in transitions between activities, etc.

Discussion

Study 1

Although Sweden has one of the highest rates of preschool attendance in the world (NCES, 2017; SKR, 2018), and although almost all children with ASD attend inclusive mainstream preschools, no previous assessment exists on the quality of intervention program setting for autistic children in the preschool. With the lack of valid rating scales of preschool environment quality for autistic children, and research suggesting low knowledge among preschool staff about ASD as well as negative attitudes towards evidence-based interventions, there is a need for such a rating scale to assess and improve the learning environment for children with ASD in Swedish preschool. In this cross-cultural validation of the APERS-PE (Odom et al., 2018), we systematically translated, revised, adapted, and validated the contents of the scale, to make it as well-adjusted and useful as possible within the Swedish support system.

Our results confirmed the content validity of the Swedish versions of APERS-PE. We found content validity beyond potential chance agreement (Polit et al., 2007) on item-, subdomain-, and domain level, and for the scale in its entirety, using the widely cited, used, and recommended (Rubio et al., 2003) content validity index developed by Lynn (1986). The experts who participated in the study judged the scale to be relevant for the delivery of intervention programs in the community-based Swedish preschool context. The results also showed the need for APERS-P-SE and the potential of using the scale as a means to assess and improve preschool program quality for autistic children. However, the invited expert raters provided some formative feedback indicating that the scale may be too comprehensive to be easily used and that it places high demands on Swedish preschools.

Several and substantial modifications were made during the adaptation process to match the original APERS-PE to the Swedish conditions. In the adapted Swedish version, only preschool children are targeted, whereas in the original scale both preschool- and elementary

school children are addressed. This was deemed necessary as the elementary school and preschool in Sweden have different curriculums, and as IEPs are not mandatory nor encouraged in the Swedish preschool, in contrast to the U.S. Furthermore, and also in contrast to the U.S., in Sweden behavior analysts, special educators, psychologists and speech- and language pathologist are typically not represented in the preschool. Rather, they act as external consultants and are usually employed by a centralized habilitation center. Thus, substantial modifications needed to be done accordingly.

Study 2 and 3

As previously noted, the vast majority of children in Sweden attend preschool, including autistic children (NCES, 2017; SKR, 2018). However, research to date suggests that the Swedish preschool lack quality for children with special needs, and that the learning environment often seems to be poorly matched with the needs of autistic children in particular (Zakirova-Engstrand & Roll-Pettersson, 2014; Långh et al., 2017; Roll-Pettersson et al., 2016; Skolinspektionen, 2017). Study 2 quantitatively evaluated an APERS-P-SE-based model to improve the learning environment quality for children with ASD in the Swedish preschool. APERS-P-SE was used as baseline assessment and derived in-service training and coaching was applied as an addition to child-focused EIBI implementation, using a quasi-experimental group design. We found that applying the APERS-P-SE-based model in addition to EIBI significantly increased the quality of the learning environment for the autistic children in the target preschools, in comparison to the preschools in which children with ASD obtained EIBI only. Specific improvements were identified for the APERS-P-SE domains Learning Environments, and Personal Independence and Competence, suggesting that the target preschools provided more and better support to the children with ASD in how to arrange the physical environment, in how to prepare for transition between activities and settings, and in how to support overall independence. In regard to children's goal attainment, no comparison was possible between the EIBI/APERS-P-SE-preschools and EIBI only group, however, children's substantial improvements (mean goal attainment 2.59) were consistent with the results for the experimental group in a similar study recently conducted in the U.S. (Sam et al., 2020a).

Proximal changes for preschool learning environment quality for children with ASD, and children's goal attainment, was not accompanied by significant changes in child- and preschool staff- outcome measures, compared to the EIBI only group. This indicates that the changes identified using APERS-P-SE did not translate to broader effects for children and preschool staff. Small to medium effect sizes were detected for several outcome measures including children's adaptive behaviors (Vineland-II), parents' ratings of children's engagement (CEQ-Parent), and preschool staff's knowledge about, use of, and self-efficacy in using EBPs for autistic children (EBP-Q), and in working with children with ASD (SESSQ-ASD). Furthermore, within-group changes indicated that the APERS-P-SE-based model was successful in promoting children's adaptive behaviors, and preschool staff's use, knowledge, and implementation of evidence-based practices for autistic children in the EIBI/APERS-P-SE preschools. Thus, it may be possible that a larger sample would have yielded significant differences between the groups. Also, it is worth noting that participating preschool staff rated the APERS-P-SE-based intervention as having a high level of social validity (SVS), which may indicate that they found the intervention helpful.

In the third and final study, we applied a qualitative design to explore the perspectives of four different groups of stakeholders about the most important features of a high-quality preschool program for children with ASD who receive EIBI and their experiences of receiving the APERS-P-SE-based intervention. Our results indicate that a high-quality preschool program for children with ASD who receive EIBI includes high levels of competence among habilitation supervisors and preschool staff. Furthermore, the preschool staff needs to work systematically and structured to promote children's learning, inclusion, engagement, and participation, and to adapt the immediate learning environment to autistic children's needs, with a close collaboration both within the preschools and with other stakeholders such as habilitation supervisors and parents. Also noted in this study was that the different stakeholder groups emphasized different quality features as particularly important.

In regard to the experience of receiving the APERS-P-SE-based intervention, our results indicate that all groups of stakeholders perceived the intervention as substantially improving the learning environment for autistic children, and thus the abovementioned features of a high-quality program, supporting the overall social validity of the intervention in line with the quantitative SVS ratings. Consistent with

previous research (Dunst et al., 2010; Fixsen et al., 2009; Gentry et al., 2008; Kucharczyk et al., 2012; Metz et al., 2015), as well as NPDC's theory of change, on-site coaching was described as an instrumental part of the intervention. It provided hands-on support in translating initial APERS-P-SE feedback with pertaining action plans into concrete action, and subsequent improvement of targeted areas for increased quality of learning environment. However, some habilitation supervisors raised concerns about the preconditions of implementing EBPs and adjusting common practice in preschools, where preschool staff lacked engagement, and there were high levels of staff turnover.

Limitations

First, for study 1, owing to the comprehensiveness of the scale, it was not back-translated. Although the first and second author had been trained in the U.S. to conduct ratings with the original version of the instrument and worked closely together to reach a consensus on translation and adaptions in comparison to the APERS-PE, it is possible that a back-translation would have produced a more accurate version of the instrument. However, hypothetically, it is also possible that a back-translation could have somewhat compromised the content validity of the wordings that had been chosen to maximize cultural relevance. Secondly, although we identified a high level of content validity, no other psychometric properties of the instrument were examined. Thirdly, we adapted APERS-PE to fit the Swedish preschool- and early intervention context. It is thus uncertain how well APERS-P-SE would fit with other programs in Scandinavia, where similar models such as in Norway (Eikeseth et al., 2002; Eldevik et al., 2012) are applied to support children with ASD in community-based preschools.

Study 2 has several limitations. No follow-up assessment was done after we terminated the APERS-P-SE-based intervention to explore if group differences remained stable over time, or if improvements in the learning environment for autistic children may have generated a flow-on effect for secondary outcomes later in time. Furthermore, 34% of all preschool staff left their preschool group during the course of the study, with the majority of attrition in the EIBI/APERS-P-SE preschools. Although attrition was not apparently connected to participation in the study, it may have limited the impact of the intervention, and identified group differences. Another limitation is the small sample size. Considering the small to medium effect sizes for several of the

outcome measures (CEQ-parent, Vineland-II, EBQ-Q, SESSQ-ASD) in favor of the EIBI/APERS-P-SE preschools group, the heterogeneity of the participating children's learning rate, and the lack of statistical power (Button et al., 2013) in the study for our secondary outcomes, it is as previously noted not unlikely that a significantly larger sample could have generated significant group differences on child and preschool staff level. Other limitations are that the sample was not representative of the ASD population estimates of about 1:3 girl/boy ratio (Loomes et al., 2017), and that no fidelity data was collected on preschool staffs' implementation of EBPs in either of the two study conditions, as in practice in Sweden, which may somewhat limit the internal validity of the study. It is furthermore not possible to rule out that low levels of fidelity may have influenced outcomes. Also, as we did not collect the exact details of how many times supervisors visited preschools for EIBI supervision in the study's two conditions, we could not evaluate its potential impact on the study's outcomes, although anecdotal data indicated no differences between the group.

For the research design, several limitations can be identified. Due to the limited sample size, it was not possible to properly stratify to ensure full equivalence before the onset of intervention. Also, because of the limited sample size, and for practical reasons, true randomization was not used, which may introduce bias and increase the risk for caveats such as selection-regression threat (Slack & Draugalis, 2001). Additionally, the lack of masking in the randomization conducted, the lack of research team and participants being blind to the group conditions, and the involvement of the research team in the intervention provided may pose threats to the internal validity of the study (Viera & Bangdiwala, 2007). However, for the group assignment, we chose to quasi-randomize and to randomize matched pairs for the second and third cohort, to ensure as equivalent groups as possible, including for example almost identical pre-intervention scores on our main outcome measure APERS-P-SE. Furthermore, goal attainment measures with GAS were only used in EIBI/APERS-P-SE preschools, to scale goals and evaluate individual goal attainment, as we did not find it feasible to ensure GAS equivalence between the two groups. Finally, it cannot be ruled out that using the same instrument for both assessment and evaluation may introduce some form of biasing effect, although we did not find any generic effect between the EIBI/APERS-P-SE preschools group and EIBI only group over all APERS-P-SE domains.

Study 3 had an exploratory and qualitative approach with a limited number of participants. Thus, the findings may not be transferable

to other community-based preschool programs where children receive EIBI, or to other preschools where autistic children do not receive EIBI. Furthermore, as stakeholders from all participating preschools that received the APERS-P-SE-based intervention were not interviewed, the findings of the study regarding the experience of receiving the model may not be transferable to all who participated in the intervention study, although it is not clear that more interviews would have improved saturation. Specifically, as there was some attrition among the preschool staff during the course of the intervention study, the experiences of those interviewed may not reflect the experiences of those who did attrite. As an alternative, participants could have been randomly selected. Furthermore, two of the interview questions were closed, which may have caused the interviewees to perceive them as leading (Agee, 2009), thus indicating what type of response was expected.

General discussion

The overall aim of this thesis was to study and highlight the importance of preschool learning environment quality for children with ASD who receive EIBI in Sweden and thus contribute to a field with very limited previous research. This included one study about the translation and cross-cultural validation of the Swedish version of the APERS to assess preschool program quality for children with ASD. It also included a quantitative study that aimed to evaluate an APERS-P-SE-based intervention model in addition to EIBI implementation, and a qualitative study that explored the perspectives and experiences of different groups of stakeholders who were connected to the research project. Odom et al. (1996) state that research that examines inclusion from an ecological perspective must be multidimensional, and that both quantitative and qualitative methods are needed. Accordingly, to capture the complexity surrounding early intervention and preschool for children with ASD in Sweden, mixed research methods (i.e., quantitative and quantitative) were used.

The findings from the research studies comprised in this thesis have demonstrated the content validity of APERS-P-SE, and the need for such a scale to assess the preschool learning environment of children in Sweden with ASD. The findings have also indicated that APERS-P-SE may be used as the foundation for improving intervention setting quality for autistic children receiving EIBI in community-based pre-

schools, and for promoting individual goal attainment, although the results did not translate into significant improvements on children's and preschool staff's outcomes compared to the control condition. Furthermore, our research indicates the complexity surrounding EIBI provision in high-quality preschool settings, with a variety of critical features for successful implementation, as well as the perceived usefulness of APERS-P-SE among stakeholders. The findings thus imply that APERS-P-SE can be used in the important, complex, and sometimes challenging task to provide early intervention to autistic children in Swedish high-quality preschool settings, where high demands are placed on both individuals and organizations over several ecological systems. Additionally, based on the analysis of stakeholders' responses in study 3, on-site coaching supported by APERS-P-SE ratings may be considered the most important component for promoting changes and improvements, within the framework of the APERS-P-SE-based model.

Most previous research on ASD and EIBI has been conducted in clinical settings and has focused on children's characteristics and contents and intensity of intervention, to understand children's development and outcomes. Arguably, such an approach to intervention research adheres more to a bio-medical than a psycho-social perspective of children's disability and development (Bölte et al., 2021; Smart & Smart, 2006). However, recent research also indicates that environmental factors should be considered and that disability should be understood in relation to functional perspectives (Bölte et al., 2019a, 2019b). Accordingly, one may argue that research about community-based early intervention should consider contextual aspects in addition to a stricter child focus. Such an approach would furthermore go more in line with Bronfenbrenner's (1979, 2005) understanding of children's development over time in relation to system ecological factors, compared to primarily understanding disability as a deficit within the individual (Bölte et al., 2021; Smart & Smart, 2006).

APERS-P-SE is designed to assess and improve the preschool program environment for children with ASD and uses Bronfenbrenner's (1979) view of ecological systems as its theoretical foundation (Odom et al., 2018). Most of the features (i.e., domains) of APERS address the microsystem in the preschool group or classroom where the child with ASD participates, entailing both structural and procedural features. However, in addition, the domains of Family Involvement and Teaming target features that indirectly influence the development of the child, thus pertaining to the mesosystem. The results from study 2

suggest that improvements were made in overall preschool program quality for children with ASD, thus concerning both micro- and mesosystems. However, the two domains of Learning Environments, and Personal Independence and Competence, were significantly improved compared to the control condition, specifically influencing the immediate learning environment for the child in the microsystem. Furthermore, in line with previous studies from the U.S., preschools in both conditions were found to score relatively higher on more structural preschool features such as Learning Environments, and Family Involvement, while procedural features such as Communication, and Personal Independence and Competence, were scored lower (Odom et al., 2013; Sam et al., 2020).

In a quite recent study, Anderson et al. (2014) discuss Bronfenbrenner's system ecological theory in regard to children in inclusive educational settings. Among the immediate contextual factors, the authors specifically highlight the importance of the social components within educational settings in the microsystem, to understand how individual and environmental factors contribute to children's development. This aligns with the Swedish national preschool curriculum's (Skolverket, 2018) and the habilitation guidelines' (FHS, 2012) emphasis on children's participation, including children with special needs in general, and ASD in particular. It also goes in line with the contents of APERS-P-SE, where substantial parts of the scale target the different social components of the preschool setting.

Furthermore, it goes in line with the findings from our qualitative study. In the interviews, autistic children's inclusion and participation is described both as a significant challenge, and an important feature of a high-quality preschool program. Specifically, stakeholders highlight the need for supervisors' and preschool staff's competence in adapting the learning environment to autistic children, and in promoting peer interaction and learning in inclusive activities. They also describe both the inter- and intra- collaboration required to succeed with the abovementioned, thus addressing both micro- and macrosystem relations.

Previous research within the context of early intervention, preschool, and ASD in Sweden has indicated challenges on several levels (Långh et al., 2017; Roll-Pettersson et al., 2016; Skolinspektionen, 2017; Westman Andersson et al., 2017; Zakirova-Engstrand & Roll-Pettersson, 2014). Among those are contradictory guidelines and recommendations, and different epistemological standpoints in the exosystem, resulting in difficulties for organizations to collaborate and successfully implement EIBI in the preschool setting in the mesosystem,

subsequently impeding the quality of the immediate learning environment in children's educative microsystem. APERS-P-SE can clearly not be used single-handedly to improve or change prerequisites on all systemic levels. But, outside of the macrosystem with its values and policies, and the exosystem with its guidelines and different organizational features, the quantitative and qualitative findings comprised in this thesis indicate that APERS-P-SE could be used as the foundation for improving the overall quality of the preschool intervention setting for children with ASD in Sweden receiving EIBI, by supporting important features and processes within the meso- and microsystem.

However, in study 2, it cannot be concluded that children's goal attainment and improved levels of engagement and adaptive behaviors over time were related to measured improvements of program environment in the EIBI/APERS-P-SE preschools. Thus, more research with larger sample sizes is needed to explore if improvements in the micro- and macrosystem of preschool learning environment will result in improved individual outcomes for children with ASD who are receiving EIBI. Furthermore, in study 1, some of the expert raters stated that the APERS may be too comprehensive to be readily used outside of a research context and that it poses big challenges to typical Swedish preschools. In addition, a few of the interviewed habilitation supervisors in study 3 described that not all preschools may be ready and well-functioning enough to be able to fully benefit from the use of the APERS-P-SE-based model. Taken together, this should be taken into consideration in the potential future use of the APERS-P-SE.

Future directions

Research about preschool, ASD, and early intervention such as EIBI is scarce in Sweden. Furthermore, very limited research about the learning environment for autistic children has previously been conducted. Based on the findings described in this thesis, the following implications for research, clinical practice, and educational practice are suggested in the sections below.

Implications for research

First and foremost, there is a need to further establish psychometric properties of APERS-P-SE, such as factorial validity, construct validity, criterion validity, internal consistency, and test-retest reliability.

Furthermore, to evaluate the APERS-P-SE-based intervention model, studies with larger samples are needed, applying truly randomized designs, preferably with raters blind to intervention or control condition. Also, the APERS-P-SE-based model could be evaluated in preschools where autistic children who receive focused interventions are enrolled, as compared to EIBI. Applying such a design would require more intensity of in-service training and on-site coaching (i.e., weekly on-site coaching), to further replicate the set-up of the original NPDC model. Finally, further research could also evaluate the effect of the APERS-P-SE-based intervention model on the children in preschool without an ASD diagnosis, who may also indirectly benefit from such an environmental approach.

For the studies comprised in the current thesis, the comprehensive APERS-P-SE scale was used by an external professional with expertise in ASD and early intervention, to assess preschool program quality. However, further research could also translate, validate, use and evaluate the self-assessment version of APERS which is designed to be used by preschool staff to self-assess their learning environment for children with ASD, and to be less comprehensive than the original APERS.

In study 2, a number of secondary outcome measures were used in addition to APERS-P-SE in order to capture the potential impact of the APERS-P-SE-based model for both autistic children and preschool staff. However, due to the comprehensive nature of APERS-P-SE, designed to cover all quality features of a preschool program for autistic children, preschool staff's outcome measures and APERS-P-SE scores may overlap. Also, for consideration in future research, one could argue that a higher number of distal outcomes entail a lower probability to identify significant multivariate effects for such outcomes. Furthermore, for the participating children, three outcome measures were used which are behaviorally related, as adaptive behaviors (Vineland-II), engagement (CEQ), and autism symptom severity (CGI-AUT) all concern autistic children's independence and need (or lack of need) of external support in their daily preschool activities. Thus, in future research, one may consider using only one outcome measure to identify potential changes within the abovementioned areas. Also, although the current research targeted autistic children's inclusion and participation in their preschools, only indirect (i.e., APERS-P-SE, and arguable CEQ-Preschool) but no direct outcome measure was used. Thus, measures specifically assessing inclusion and participation could be taken into consideration for future research as potential outcomes.

Overall, the findings in the current thesis support the notion that there is a need to improve preschool learning environment for children with ASD in Sweden. Specifically, based on the APERS-P-SE baseline ratings from study 2, the participating preschools struggled in the domains of Curriculum and Instruction, Personal Independence and Competence, Functional Behavior, and Communication. This suggests that these domains may be of specific importance to further examine and improve for preschools in Sweden, in future research.

Clinical implications

Based on the findings from the qualitative study included in the current thesis, implications emerge that may be valuable for clinical practice in implementing EIBI programs. First and foremost, all preschool staff of the autistic child enrolled in an EIBI program should if possible be included and somehow engaged in the EIBI implementation, including the preschool teacher. Furthermore, children's goals and the focused interventions used within EIBI programs should be chosen in regard to, and if possible be adapted to and embedded in the regular preschool routines. Subsequently and importantly, supervision or coaching should preferably be provided on-site, where most of the EIBI implementation actually takes place.

For the focused interventions used within the EIBI program, peer-mediated instruction and intervention may be specifically useful to create learning occasions in naturalistic settings, to promote participation, inclusion, and peer relationships. However, for the use of peer-mediated instruction and intervention, and to appropriately embed goals and instructions in regular activities, it is important that habilitation supervisors receive adequate training and support to ensure preparedness and comfortability in providing on-site coaching or supervision. Furthermore, the findings suggest that it may be valuable to consider the learning environment before implementing EIBI, that it is important to adapt the learning environment to autistic children, and that APERS-P-SE may be used to do so, in collaboration between preschool staff and habilitation supervisors.

Educational implications

To provide a high-quality learning environment for autistic children, based on the qualitative study, a number of different features and processes seem to be of specific importance. First, group sizes for children

should ideally be adjusted, to allow for all children to participate and learn in as many activities as possible. Typically, this entails limiting the group size, for example by dividing a larger group into two smaller groups. Secondly, visual supports should be implemented, as well as physical delineations, to provide structure and predictability of the learning environment for all children, including children with special needs such as ASD. Thirdly, the findings also suggest that typically developed peers are of great importance for autistic children. They may serve as role models and peer-buddies, and provide opportunities for mutual learning in communicating and interacting with autistic children.

For preschool staff working with autistic children, our findings suggest that collaboration and joint responsibility within the preschool group is of great importance, to both improve knowledge and skills among staff, and for children with ASD. Furthermore, to ensure sustainability over time, it is important to establish structures, activities, and procedures through documentation and planning, and the abovementioned collaboration and shared responsibility, that are not dependent on individual preschool staff such as paraprofessionals receiving supervision from a habilitation center.

Finally, our findings suggest that APERS-P-SE may be used to support the abovementioned quality features. However, the research comprised in the current thesis does not imply or propose how and by whom assessments should be performed outside of a research context, although one may theoretically consider that such assessments could be provided by qualified staff within the municipality, or as a part of EIBI implementation provided by habilitation staff.

Conclusions

Overall, the conclusions of this thesis can be summarized as follows: (1) There is a need to assess and improve the learning environment for children with ASD who are receiving early intervention in the Swedish preschool. (2) APERS-P-SE is an instrument with a high level of content validity for the Swedish preschool and early intervention context, although it may be perceived as too comprehensive, and posing challenges to typical Swedish preschool. (3) More studies are warranted to examine further psychometric properties of APERS-P-SE, as well generalizability to preschool and early intervention systems in other Scandinavian countries. (4) APERS-P-SE may be used as the foundation of

providing in-service training and on-site coaching, in order to promote preschool program quality for children with ASD who are receiving EIBI. (5) Although the APERS-P-SE-based model proved superior to EIBI only for proximal outcomes, no significant effects were identified on distal outcomes for children's and preschool staffs' outcomes. (6) The preschool staff who received APERS-P-SE-feedback, in-service training, and on-site coaching perceived the intervention as highly relevant and helpful. (7) More research with larger sample sizes over longer durations of time is needed to assess if an improved learning environment for autistic children (as measured with APERS-P-SE) can generalize to significantly improved outcomes for autistic children and preschool staff, compared to an EIBI only condition. (8) EIBI provision in community-based Swedish preschool programs is according to stakeholders a complex task involving several important aspects on both micro- and mesosystem level. (9) Staff's competence, children's inclusion and participation, collaboration, and immediate learning environment were among interviewed stakeholders identified as key aspects of successful support and intervention for autistic children in their preschool setting. (10) Most stakeholders perceived the APERS-P-SE-model as helpful in regard to the abovementioned features, and thus to improve the overall learning environment for children with ASD in their preschool. (11) APERS-P-SE-informed on-site coaching was identified as the most important component for improving learning environment, and supporting children's learning, inclusion, and participation. (12) A few habilitation supervisors experienced that some preschool settings may be too dysfunctional to be able to successfully apply the APERS-P-SE as an addition to EIBI. (13) Some habilitation supervisors commented that they may have lacked the necessary knowledge and skills to comfortably and successfully embed inclusive focused interventions in naturalistic settings in line with what preschool staff requested.

Thus, to further and finally summarize, APERS-P-SE is a rating scale designed to assess the program environment quality for children with ASD in the Swedish preschool, with a high level of content validity. APERS-P-SE may in combination with in-service training and on-site coaching be used to assess and systematically improve preschool program quality, as a complement to standard EIBI provision. Stakeholders described staff's competence, children's inclusion and participation, collaboration, and learning environment, as the most important features of a high-quality preschool program for autistic children, and believed that the APERS-P-SE-based model had been helpful in im-

proving the abovementioned features. More studies are necessary to establish further psychometric properties of APERS-P-SE, to assess if an improved learning environment for autistic children can generalize to children and staff outcomes, and to explore the effects of applying APERS-P-SE to preschool programs where focused interventions rather than EIBI are provided.

Swedish Summary

Lärmiljön för barn med autismspektrumtillstånd (AST) i förskolan är av stor betydelse. Trots det är forskningen inom området begränsad. Inom forskning om tidiga insatser har de flesta tidigare studier fokuserat på barnets egenskaper, samt innehåll och kvantitet i insatser, snarare än de miljöer insatserna ges i. I motsats till det är det övergripande syftet med den här avhandlingen att genom användandet av the Autism Program Environment Scale (APERS) kasta ljus på och studera betydelsen av kvalitet i lärmiljö för barn med AST som får mångsidiga program i svenska förskolor.

I studie 1 översattes, kulturanpassades, och skattades innehållsvaliditeten i den svenska versionen av APERS (APERS-P-SE), som är utformad för att skatta den övergripande kvaliteten på lärmiljön för barn med AST i svensk förskola. Under processen gjordes omfattande revideringar av instrumentet, för att göra det mer relevant och användbart för den svenska förskolekontexten. Nio experter skattade klarheten och fullständigheten för enskilda items, samt relevansen för skalans domäner, och för skalan som helhet. I studie 2 utvärderades användandet av APERS-P-SE som grund för professionell utveckling av förskolepedagoger som arbetar med barn med AST som får mångsidiga program, för att utveckla kvaliteten på lärmiljö i förskola för barn med AST (primärt utfallsmått), samt utfallsmått för autistiska barn och förskolepedagoger (sekundära utfallsmått). I en kvasi-experimentell design fick förskolepedagoger under åtta månader antingen implementera mångsidiga program, med extra fortbildning och coachning på plats i förskolan baserat på skattningar med APERS-P-SE som tillägg (k = 9), eller mångsidiga program som vanligt under (k = 8). Totalt deltog 17 förskolor, 17 barn och 35 förskolepedagoger. I studie 3 genomfördes individuella intervjuer samt en fokusgruppintervju med förskolepedagoger, förskolerektorer, handledare från habiliteringen, och föräldrar till barn med AST, som hade deltagit i studie 2 och tagit del av den APERS-P-SE-baserade interventionen. Genom intervjuerna bidrog de olika grupperna av respondenter med sina tankar om vad de uppfattade som de viktigaste aspekterna för barn med AST i förskolan, som får mångsidiga program.

Respondenterna bidrog också med sina tankar och erfarenheter av att delta i studie 2. Tematisk analys användes för att analysera all verbal data.

Resultaten i studie 1 visade på en hög grad av innehållsvaliditet för den svenska versionen av skalan (APERS-P-SE), och ett stort behov av att kunna använda en skattningsskala som APERS-P-SE för att ge stöd till barn med AST i svensk förskola. Skriftlig, kvalitativ återkoppling indikerade att en skala som APERS-P-SE är nödvändig för att kunna utveckla lärmiljön för barn AST i svensk förskola, som i dagsläget inte är tillräckligt god. Återkopplingen indikerade också att skalan kan anses som för omfattande, och att den ställer höga krav på den svenska förskolan utifrån nuvarande förutsättningar.

I studie 2 uppvisade förskolorna i EIBI/APERS-P-SE-gruppen signifikanta förbättringar i sin lärmiljö för barn med AST jämfört med gruppen som bara fick mångsidiga program. Utfallsmåtten för barn med AST och förskolepedagoger var dock inte signifikant förbättrade jämfört med kontrollgruppen, trots positiva deskriptiva fynd. För att kunna fastslå om fortbildning och coachning på plats baserat på skattningar med APERS-P-SE kan skapa beteendemässiga förändringar för förskolepedagoger och barn med AST behövs studier med fler deltagare, som pågår under längre tid. I studie 3 identifierades fyra teman som nyckelfaktorer för kvalitet i förskola för barn med AST, för att stötta deras utveckling. De var: personalens kompetens, inkludering och delaktighet, samarbete, samt lärmiljö. Överlag beskrev de olika grupperna av respondenter APERS-P-SE med tillhörande fortbildning och coachning på plats som en hjälpsam modell för att bidra till barns ökade delaktighet, föreskolepedagogers engagemang med barnet, och för att optimera utfallet av tidiga insatserna för barnet. I synnerhet lyfte respondenterna fram att coachningen på plats i förskolan, baserad på skattningar med APERS-P-SE, var hjälpsam för att utveckla kvaliteten i förskolans lärmiljö för barn med AST.

Resultaten från studierna i den här avhandlingen indikerar att APERS-P-SE är ett instrument med hög grad av innehållsvaliditet som kan användas i kombination med fortbildning och coachning på plats i förskolan för att utveckla kvaliteten i lärmiljön för barn med AST, i linje med vad de olika grupperna av respondenter från studie 3 uppfattade som viktigast för barn med AST i förskolan. Implikationer för framtida forskning, klinisk praktik, och pedagogisk praktik diskuteras.

Nyckelord: Autism, mångsidiga program, förskola, lärmiljö, tillämpad beteendeanalys

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