TRAINING PARENTS AND EDUCATORS ON APPLIED BEHAVIOUR ANALYSIS (ABA), PLAY-BASED, AND SPEECH-LANGUAGE INTERVENTIONS FOR STUDENTS WITH AUTISM SPECTRUM DISORDER (ASD)

By

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THESIS SUMMARY

Chapter 1

The first chapter provides a general introduction to the nature and purpose of this work, which focuses on the implementation of the SEC-ETP Project. This was a publicly funded effort aimed at training parents and educators of students with complex needs such as autism spectrum disorder (ASD) enrolled in preschools, primary and secondary schools across the state of Sonora in Mexico. The Project was divided in several phases, the data collected during four of those phases is presented throughout the chapters in this work.

Chapter 2

To address the multi-faceted role adopted by the main researcher throughout this work, this chapter outlines the theoretical and practical training experiences that shaped the author's views and approach to providing interventions and developing public and private special education projects over the years. By doing so the author offers a context within his which his beliefs, perspectives, roles, and potential biases as an active participant in the development and implementation of the research and their potential effects can be adequately appraised by the reader.

Chapter 3

This chapter is a systematic literature review focusing on training parents and educators to administer applied behaviour analysis (ABA), play-based, and speech-language interventions tailored for school-age children diagnosed with autism spectrum disorder (ASD). Initially, the chapter provides an extensive overview of ASD, its known causes, and diverse conceptualisations. It delves into the prevalent use of ABA-based interventions, prominent across most reviewed studies. Additionally, it examines the adoption of play-based strategies and the intricacies involved

in crafting individualised intervention programmes, structured around varied evidence-based interventions (EBIs). This review underscores the disparity in research attention between interventions led by parents and educators for school-age children with ASD compared to those led by specialists or conducted in clinical environments. Notably, it observes a proclivity towards naturalistic interventions, particularly ABA-based and NDBI-based interventions within home and school settings. Importantly, the review stresses the significance of evaluating both child/student outcomes and outcomes pertinent to parents and educators when assessing intervention efficacy in line with the National Standards Project (NSP) criteria.

Chapter 4

In Chapter 4, Study I examines the outcomes of two cohorts of parents and educators participating in structured theoretical training sessions, conducted in both in-person and teleconference-based formats. The study investigates the effects of different training formats on participants' knowledge and self-efficacy in delivering interventions for children diagnosed with ASD in home and school settings. Employing a pre-post design, participants underwent assessments of their knowledge and self-efficacy before and after training. The findings suggest that both in-person and teleconference-based training formats effectively enhanced participants' knowledge and self-efficacy in implementing interventions for children with ASD. These outcomes offer implications for designing and delivering parent and educator training across home and school settings, affirming the efficacy of both in-person and teleconference-based formats. Moreover, they advocate for ongoing attention and technological advancements to facilitate widespread dissemination of best practices to pertinent stakeholders, aligning with NSP criteria for effective interventions.

Chapter 5

Study II used a mixed-methods model to appraise the outcomes of a group of children who received individualised intervention programs delivered by their parents in the home setting. Measures used to assess child outcomes included autism severity scores, intervention frequency data, and data related to the number of interventions and target skills acquired over time. Parent outcomes included self-reports of instructional efficacy, and narrative descriptions of their perceptions of the SEC-ETP Project.

The results from this study suggest that increased attention to relationship between parent knowledge of interventions and child outcomes could be facilitated by closely looking at parent knowledge in the context of these and other interventions. In the case of study II, there were some statistically significant increases self-reported measures of instructional efficacy. In turn the amount of supervision received by parents was positively associated with measures of overall intervention frequency, but not with the average number of trials per drill, suggesting that severity of symptoms of ASD in this case did not appear to be related to the likelihood that parents actively engaged the programme by delivering and recording interventions. However, this also suggests that parents require substantial and consistent support at least in the first few months of intervention to maintain a consistent and productive calendar of interventions which can take place in the home. By addressing the specific needs and concerns of families, intervention can then take place in familial environments where specific parental needs may have been responsible for decreased generalisation of interventions in the home. The limitations of the study include a limited sample of parent and student participants, no follow-up measures for parent and student outcomes, and limitations of the tools used for data analysis.

Chapter 6

The last chapter describes the primary findings and conclusions drawn from the comprehensive research. It accentuates the key outcomes from Studies I and II. The chapter deliberates on the implications of these results for clinical practice and future research, highlighting substantial differences observed between parent and educator theoretical training. Although parents exhibited lesser quantitative increases in intervention knowledge measures, their scores remained notably higher than educators across pre and post-training conditions. This chapter concludes by acknowledging its limitations, providing insights to refine training and intervention methodologies, thus aligning with NSP's recommended directions for comprehensive intervention research.

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GLOSSARY OF TERMS

The following is a compilation of terms used in the current study and is related to autism spectrum disorder (ASD) education and intervention. It is not a comprehensive list of all terms used in behaviour analysis, parent training or ASD intervention, and should not be used to supplement a definition published elsewhere. It describes specific concepts related to the intervention and variables of interest in this research (e.g., discrete-trial terms such as drill, trial or antecedent), as well as those related to the nature of the current research (the SEC-ETP Project) and its participants. Terms throughout this work which refer to this glossary are marked with an asterisk (*).

Term	Definition
drill/trial	Specific moment in time when a program (goal) is implemented and begins when the adult signals the start of a structured teaching period and ends with a corresponding verbal cue. It is composed of one or several trials. Each drill is recorded in one line of timestamped data when the adult presses the 'record' button in the *therapyConnect* data collection interface.
ETP	*Explora tu Potencial, A.C. (ETP)* is a non-governmental organisation with the social objective of providing special education training and intervention services in private and public clinical settings in the States of Sonora and Chihuahua, in México.
Individualised Education Plan (IEP)	The result of the Programme Design Meeting, it is a set of program and protocols that define the specific teaching strategies for use with a particular student.
parent	Parent of a student within the SEC-ETP Project who provided informed consent for him or herself and his or her child to become participants in this study. One parent was self-assigned as the representative parent, and the one to deliver interventions.
profile (*therapyConnect* student ID)	Secure online repository where the programs and protocols for each student are stored, along with performance data for each program.

program (goal)	Specific activity within a student's Invidualised Education Plan (IEP) aimed at teaching a specific skill or target behaviour.
Programme Design Meeting	Period after the evaluation session when the parents, supervisor and main researcher met via videoconference to discuss the results of the evaluation and collaboratively draft an Individualised Education Plan (IEP).
protocol	Procedure to follow to manage specific situations or teach specific behaviours in and out of structured teaching scenarios (i.e. how to react when the child needs support to recover control over self). It is part of each student's Individualised Education Plan (IEP) and recorded in his or her *therapyConnect* profile.
SEC	*Secretaría de Educación y Cultura* [Secretariat of Education and Culture] is the State of Sonora's government entity tasked with providing public regular and special education services for autistic students in the state of Sonora, México.
SEC-ETP Project/Project	The Project is a collaborative and interinstitutional initiative by SEC and ETP aimed at providing special education support and training to autistic students enrolled in public schools of Sonora, México, their parents and educators.
SEC-ETP Supervision Team	The SEC-ETP supervision team is directed by the main researcher in this study, and includes project supervisors.
student	Child for which informed consent was provided for participation in this study, after their enrollment in the SEC-ETP Project.
study	The current research study, and an analysis of the quantitative and qualitative data routinely collected as part of the SEC-ETP Project.
supervisor	Graduate professional from the fields of: psychology, early development studies, special education, regular education, or with partial or complete graduate studies in the same fields, and 3 or more years of full-time, supervised working experience with individuals diagnosed with autism spectrum disorder (ASD).
target	Individual target to master within a program (i.e. the letter "A" is a target within the program "Receptive Identification of Letters"). Date of introduction and mastery are recorded in the *therapyConnect* central database for each student profile.
teaching segment	Specific moment in time when drills are implemented and begins when the adult signals the start of a segment, and ends with a corresponding visual or verbal cue. It is composed of one or several drills.
trial	Moment in time within a drill that is composed of an instruction (antecedent), response (behaviour) and feedback (consequence) directed towards learning a specific skill or target behaviour.
EBI intervention	Intervention with peer-reviewed positive outcomes in individuals with ASD.
EBI model	Framework of EBIs with specific aims and theoretical underpinnings.

implementation	Delivery of intervention.

ABSTRACT

This thesis explores the effectiveness of parent and educator-delivered interventions for school-age children with autism spectrum disorder (ASD). A literature review and two studies were conducted on data collected by the *Secretaría de Educación y Cultura* [Secretariat of Education and Culture] and *Explora tu Potential A.C.* [Explore your Potential A.C.] Project (SEC-ETP) to examine the outcomes of training and interventions for students diagnosed with ASD enrolled in public schools across the state of Sonora, Mexico, as well as their parents and educators.

The first study aimed to assess the impact of parent and educator training on instructional self-efficacy, perceptions of a working alliance, and support provided by SEC. Results showed significant improvements in scores for instructional self-efficacy for parents and educators from in-person and teleconference training cohorts. However, there was a significant increase in scores related to play-related interventions for the teleconference parent cohort, but not the in-person cohort.

The second study aimed to examine the effectiveness of parent-delivered interventions in the home setting and the parent and student outcomes. Results showed no significant improvements in ASD severity scores between pre and post-intervention periods. However, there were some notable relationships between measures of frequency of intervention and number of specific acquired skills.

This thesis highlights the need for further research on parent and educator-delivered interventions for school-age children with ASD. The findings suggest that naturalistic

development-based interventions (NDBIs) or ABA-based interventions complemented by NDBIs may be more appropriate in home and school settings and that there is a need for more robust support via training of parents and educators for interventions to effectively take place. Additionally, more research is needed to understand the limitations of these interventions and the potential biases that may have affected the results of the studies.

The author's personal and professional investment in the development and implementation of the interventions, as well as in the publication of this work as a doctoral thesis, could have contributed to confirmation bias and affected the stakeholders' willingness to adhere to the intervention models and present the project in a positive light. It is important to carefully consider and address these conflicts of interest to ensure the reliability and credibility of the research findings.

Chapter 1

Introduction and context of this work

The SEC-ETP Project, a collaborative initiative in Sonora, Mexico, was a collaborative effort to enhance interventions for children with autism spectrum disorder (ASD) within home settings. This project, spanning several years, involved parents, educators, and officials, aligned with a substantial number of the National Standards Project (NSP) guidelines. The NSP, a recognised set of benchmarks, outlines best practices for ASD interventions, ensuring evidence-based strategies.

In evaluating the SEC-ETP Project, I've employed the NSP as a benchmark for its rigorous standards and evidence-based approach to assess the effectiveness of interventions for individuals with ASD. The project aimed to equip parents and educators with vital skills and knowledge for intervention delivery, aligning closely with the NSP's emphasis on evidence-based practices.

To rigorously evaluate the project's impact, a series of studies were conducted. These studies, consistent with NSP principles, meticulously analysed outcomes from the training and implementation phases. Figure 1 in this thesis provides an overview, delineating the training modules, implementation strategies, and specific studies undertaken, adhering closely to NSP guidelines. This systematic evaluation aimed to enhance understanding and effectiveness in delivering ASD interventions within home settings, following the NSP's recognized standards.

Figure 1. Timeline of the SEC-ETP Project and their relationship to studies I and II.

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                            ┌─────────────────┐
                            │     Study I     │
                            └─────────────────┘
                            ┌─────────────────┐
                            │    Study II     │
                            └─────────────────┘
┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐
│ Third training   │  │ Third            │  │ Fourth training  │
│ phase of the     │  │ implementation   │  │ phase            │
│ project          │  │ phase of the     │  │ of the project   │
│                  │  │ project          │  │                  │
└──────────────────┘  └──────────────────┘  └──────────────────┘

October   December      April    June       October  December
2019      2019          2020     2020       2020     2020
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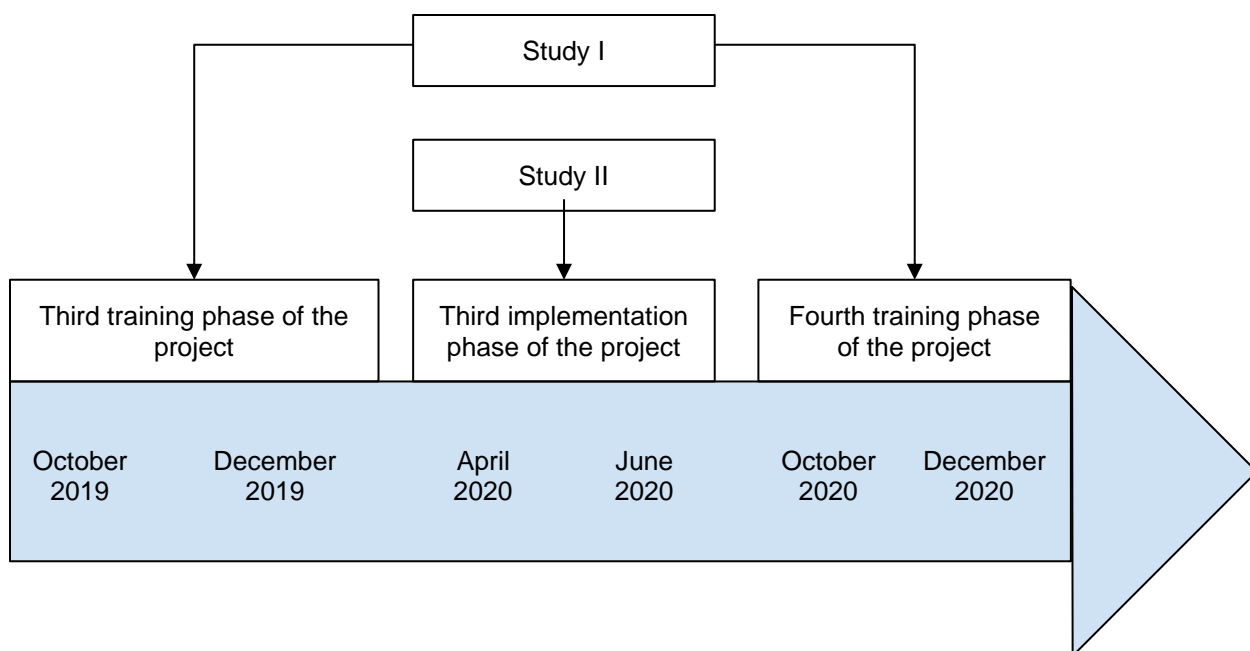
The SEC-ETP Project was a comprehensive, interinstitutional program that aimed to improve outcomes for children with autism spectrum disorder (ASD) through parent-delivered interventions in the home setting. The project consisted of two phases: training and implementation. The training phase focused on providing parents and educators with the necessary skills and knowledge to deliver evidence-based interventions in the home and school settings. The implementation phase focused on the actual delivery of interventions in the home, with ongoing support and supervision provided to parents by trained professionals. This chapter outlines the specific steps involved in the implementation phase of the SEC-ETP Project, including the initial assessment and individualised education plan design process.

The systematic literature review in the following chapter, aimed to explore the types of interventions parents and educators have been trained to implement in home and school settings in highly controlled studies, as well as to explore the outcomes for children, parents, and educators. Study I examined the outcomes of a group of parents and educators who attended structured theoretical training sessions in in-person and online training formats to learn about

ABA, play-based, and speech-language interventions. Study II was a mixed-methods exploratory study which aimed to evaluate the outcomes of a group of children who received individualised intervention programs by their parents, who have received theoretical training in ABA, play-based, and speech-language interventions. The results of these studies were used to identify the factors that contribute to the successful delivery of interventions for children with ASD in the home setting and to provide recommendations for future research and practice.

Development of a Public Education Autism Service

The following is an in-depth account of the implementation of a multi-phase project designed to provide specialised interventions to students with autism spectrum disorder (ASD) enrolled in public schools in the state of Sonora, Mexico. The project began with the development of an evidence-based intervention (EBI) programme, which combined principles of applied behaviour analysis (ABA), play-based interventions, and speech-language therapy to meet the unique developmental and learning needs of groups of children with ASD in northern Mexico. This was followed by the implementation of the project in four distinct phases. This Project was known as the SEC-ETP project. Through this account, the author aims to provide a comprehensive overview of the development and evolution of the ETP training program, which served as the foundation for the SEC-ETP project. The final two phases of the project are the focus of the studies presented in this work.

The SEC-ETP Project

The SEC-ETP Project was developed in response to the growing demand for training and support for individuals with ASD in Mexico. In 2013, the main researcher developed the ETP Instructor Training Course to provide theoretical and practical education to parents, educators, professionals, and university students on the principles of evidence-based interventions for

individuals with ASD. *Explora tu Potencial, A.C.* (ETP) is the non-governmental organisation co-founded by the author for the provision of such services to populations of children with developmental disabilities in communities in Mexico. The curriculum was based on training competencies developed for training speech and occupational therapists on the implementation of ASD-related EBIs in the United States in previous years and consisted of 72 hours of training divided into six units: *Structuring an Intervention Session*, *Play-based Interventions*, *ABA Interventions*, *Speech and Language Intervention*, *Academic Programme Design*, and *Skills for Independent Living*. The first class of 25 participants, including parents, educators, and professionals, completed the course in Hermosillo, Sonora over a six-month period. After the success of the first cohort and over the course of the following years, hundreds of additional parents and providers were trained at ETP to provide interventions to individuals with ASD and other developmental disabilities in Hermosillo, Sonora, and Ciudad Juárez, Chihuahua in Mexico.

Parallel to the development of these two clinical projects, the main researcher also began liaising with the State of Sonora's Education Secretariat (SEC) early in 2015 to plan a joint special education project for public schools in Sonora. This was a years-long effort which eventually led to the creation of the multi-phase SEC-ETP Project, the final two phases of which are the subject of studies in this work.

The Intervention Pathway

The process of admission of students into the SEC-ETP Project included an initial parent interview, observation and evaluation sessions, and a program design meeting. Parents were then guided to provide interventions in their home with the support of telehealth-based supervision (Figure 2). The goal of the implementation phase was to gather comprehensive information about

each child's needs and context in order to design and periodically update individualised education plans that would lead to improved outcomes for the child.

Figure 2. Student participant assessment pathway
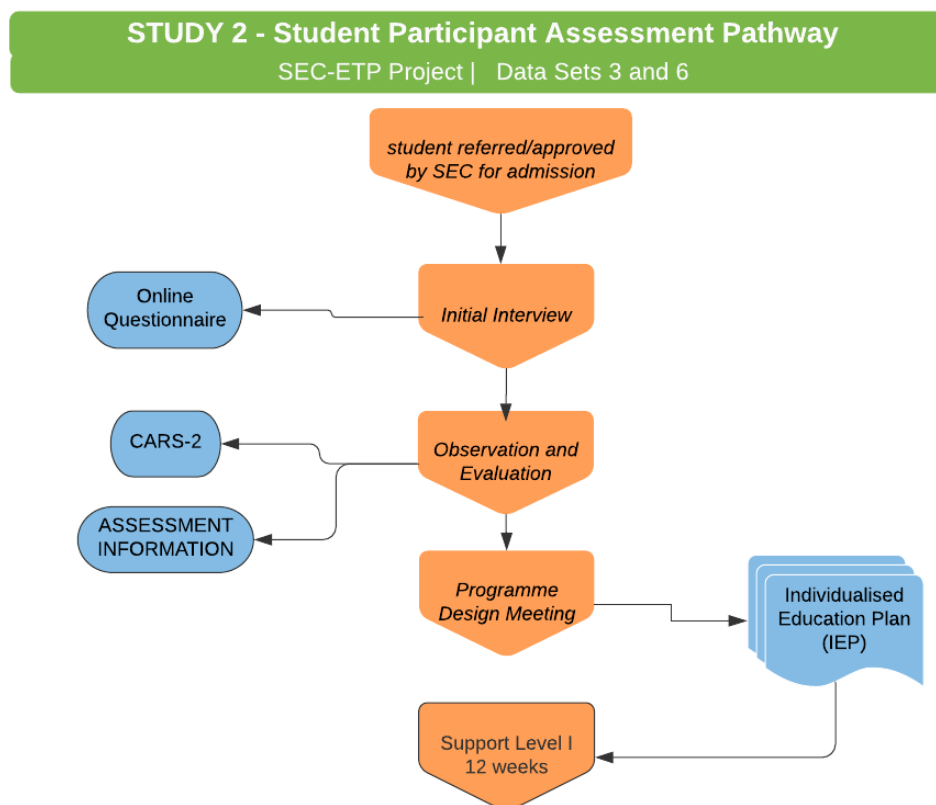
This process included an initial parent interview, observation and evaluation sessions, followed by a program design meeting and subsequent implementation. During the initial interview, parents were asked to share their areas of interest and urgent concerns, as well as provide information about the child's developmental history. A brief online questionnaire was also completed before the interview to gather additional information. Based on the information

gathered during the initial interview, an initial evaluation was scheduled to baseline specific target behaviours and evaluate the child's skills in different developmental domains such as daily living, academic, and social. The supervisor directed the parents to perform specific tasks during the evaluation and the results were used to generate a preliminary report and develop an individualised education plan (IEP).

During the final program design meeting, the results of the evaluation were presented to the parents along with recommendations of specific programs or protocols to be added to the IEP based on the child's learning needs. Parents were encouraged to express additional areas of concern during this time, and when appropriate, specific programs or protocols were added to the IEP. The programs recommended were based on current developmental and academic functioning levels, with a focus on both discrete trial and play-based interventions. Parents were trained to provide interventions directly under the guidance and support of supervisors, who provided ongoing support and monitoring to ensure the effectiveness of the interventions. The goals and objectives within the IEP were regularly reviewed and updated as the child made progress, with the aim of gradually increasing the complexity of the goals over time.

The interventions

The SEC-ETP Project applied a range of interventions to support students and their families. The project utilised applied behaviour analysis (ABA) interventions, such as acquisition and extinction, shaping, prompting and fading, giving instructions, trials, random rotation and generalisation, as described in the Lovaas The Me Book: Teaching Developmentally Disabled Children (Lovaas, 1981). It is important to note that the project only adopted certain behavioural interventions from this work, such as discrete-trial teaching (DTT), and did not include interventions such as punishment and overcorrection. Additionally, the project incorporated play-

based interventions to increase engagement, establish a positive association between the student and structured learning tasks, and encourage desired communicative behaviours. These play-based interventions were applied individually based on the student's interests and familial context.

During the implementation phase parents were trained to deliver interventions in the home with guidance and support from supervisors. All contact between supervisors and participants took place in a telehealth format, beginning with an initial questionnaire that parents completed to provide demographic information, developmental history, academic and therapeutic history, and specific concerns. This information was used to determine the best materials and arrangements for the initial evaluation and to develop individualised special education plans for implementation by parents in their home. The project also followed a specific delivery pattern that included play-based periods between teaching segments and tailored the length of teaching drills based on observations of optimal attention and focus periods obtained during the initial evaluation process. Figure 3 is a screen capture of the interface parents used on *therapyConnect* to collect data during implementation sessions.

Figure 3. therapyConnect data collection interface: (A) programme description; (B) target/objective list for this programme/intervention; (C) round buttons to mark selected targets, and square buttons to record or erase data; and (D) the digital data sheet where intervention data is displayed.
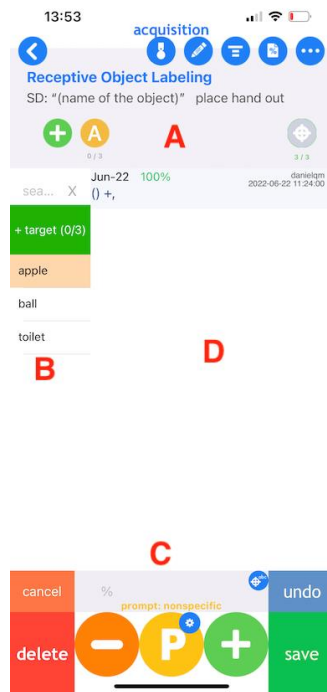
The SEC-ETP Project applied structured activities, known as programmes, to students through a discrete trial teaching (DTT) format, as well as individualised recommendations, known as protocols, that were integrated into daily living routines, as determined by parents (An example can be seen in figure 4). Programme selection was guided by the curriculum published in the work Teaching Developmentally Disabled Children by Dr. O.I. Lovaas (1981), which includes structured programmes/activities within the domains of Getting Ready to Learn, Imitation and Early Language, Basic Self-Help Skills, Advanced Language and Expanding the Child's World. These programmes were designed to target academic skills as well as underlying skills necessary for student learning, such as attention, engagement, imitation, language comprehension, and positive associations with learning tasks (Lovaas, 1981). Family priorities, consideration of aspects of functional communication and play-based skills played a significant role through the process or intervention design.

To facilitate programme selection and data tracking, parents were provided with an online interface (Figure 3) to record intervention data, view, and modify target lists and programme descriptions. Study II provides a detailed description of the contents of the discrete-trial training manual distributed to parents as part of the parent training phase of the Project, which took place prior to the implementation phase that is the

Guidance and Support Sessions

Support and guidance sessions consisted of 60-minute intervals which began with parental reports during a brief, 5–10-minute discussion of overall student performance since the date of last session. During the following 45-50 minutes, parents were guided to deliver interventions in the form of exercises/drills which were often delivered in structured settings such as a table and chair, with occasional minor adjustments as needed and appropriate. Parents were also guided as they scored and recorded delivered exercises/drills by using a data tracker interface (Figure 3). By using this interface to score each exercise/drill parents rated each trial as incorrect, cued/prompted, or independent. The rating for cued/prompted allows users to specify the type of cued administered (i.e. physical guidance, pointing), and record each exercise drill after several trials have been rated by using the record button.

Figure 4. An example of an IEP for a 6-year old fictional student who presents with significantly limited attention and focus periods, emerging literacy and mathematical thinking (he can receptively and expressively identify numbers and letters and other abstract concepts). He uses words and short phrases to communicate and can follow single-step directions in limited contexts.

Sample Individualised Education Plan (IEP) - Anthony

Program	Description
Matching Words to Pictures	Anthony will match a word to the corresponding picture when presented with a visual field of three pictures with no additional cueing. Targets: • Nouns (object, people, places) • verbs • adjectives Materials: • Index cards with printed words in lowercase. • Pictures or drawings of matching concepts. Mastery Criteria per target: 1. Mass trial each target until a is 100% are obtained. 2. Rotate randomly with other known targets until two consecutive 80% are obtained.
Word Formation	Anthony will form a word when provided with separate letter cards, or will type on a device when presented with a picture of the target concept. Targets: • Introduce target words as they are mastered in the *Matching Words to Pictures* program. Materials: • Separate printed letter cards. • Device with a keyboard. Mastery Criteria per target: 1. Mass trial each target until a is 100% are obtained. 2. Rotate randomly with other known targets until two consecutive 80% are obtained.
Matching Quantities	Anthony will match written numbers with the corresponding pile of objects, when presented with three piles of objects of different quantities. Targets: • Numbers 1-10 Materials:

	• Small index cards with printed large numbers. Mastery Criteria per target: 1. Mass trial each target until one is 100% are obtained. 2. Rotate randomly with other known targets until two consecutive 80% are obtained.
Auditory Instructions	Anthony will chain verbal directions to complete sequences in order with no additional cueing. Targets: • 2-step directions • 3-step directions Materials: Chains of verbal instructions relevant to home or school-based routines. Mastery Criteria per target: 1. Mass trial each target until a is 100% are obtained. 2. Rotate randomly with other known targets until two consecutive 80% are obtained.
Listening Comprehension	Anthony will answer 2-3 questions after listening to a 1-2 sentence passage visually presented and read aloud by the instructor. Targets: • 1-2 sentences • 3-4 sentences • 2 paragraphs • 3 paragraphs Materials: Reading should be based on Anthony's interests and inclinations, and when appropriate, to academic curriculum in order to support acquisition of target material. Mastery Criteria per target: 1. Mass trial each target until a is 100% are obtained. 2. Rotate randomly with other known targets until two consecutive 80% are obtained.
Protocol	Description

Circles of interaction	Between teaching segments, engage Anthony in play-based activities of his choosing, engaging the offering-waiting-reacting cycle until a 3-5 interactions are completed, before calling him back to structured learning tasks.

Session Structure and Program Frequency

Structure
- Each session will begin with a 5-10 minute interactive play period, followed by intermittent teaching segments for the duration of the session, during which the recommended number of exercises is targeted.
- A 1-2 minute interactive play period will be placed before each teaching segment.
- Alternating interactive play and teaching segments will be completed for the duration of the session.

Frequency
Based on Anthony's knowledge base and existing academic skills, as well as those reported by his family and evidenced during the evaluation process, the following program frequency schedule is recommended.

# of programs	Exercises per program per day	Exercises per segment	Approximate average time per exercise	Approximate weekly hours
5	8-10	1	4 minutes	18-23

The intensive behavioural intervention model on which many of the recommended interventions within the SEC-ETP Project have a basis, has evidenced sustainable results with high levels of intervention intensity (Lovaas, 1981). In order to provide a measurable of *high intensity* that parent participants could benchmark and systematically pursue, the recommended range of hours per week was based on the above specified definition of dose (average of 8-12 doses/drills per hour) and the number of recommended goals along with their recommended number of doses/drills per day. For example, a student who is recommended a total of six goals, by repeating each goal 8-10 times per day would be expected to complete between 48 and 60 exercises, or an approximate total of 4 to 5 hours of individualised intervention in one day.

The IEP for each student was added to its electronic database under a unique profile, through which parents were able to access all details of their plan via their individual *therapyConnect* account. This platform was used by parents to collect program data in a centralised database, making such data available in real time to the supervisor or main researcher during training and guidance and support sessions.

Support and guidance sessions

Support and guidance sessions were structured 60-minute intervals that began with a brief, 5–10-minute discussion of the student's overall performance since the last session. During the following 45-50 minutes, parents were provided with guidance and support as they delivered interventions in the form of exercises and drills, which were often delivered in structured settings such as a table and chair, with occasional adjustments made as needed and appropriate. Parents were also guided in how to score and record the exercises and drills they delivered, by using a data tracking interface (Figure 3). This interface allowed parents to rate each trial as incorrect, cued/prompted, or independent. The rating for cued/prompted also allowed parents to specify the type of cue administered (i.e. physical guidance, pointing), and record each exercise or drill after several trials have been rated by using the record button. This system ensured that parents were able to accurately track and record progress and make adjustments as needed to improve student outcomes.

Frequency of guidance and support sessions was collected by reviewing beginning and end times for contact notes written by the assigned supervisor after each session for every student within the implementation period. These notes were generated electronically by the supervisor and signed by the parent, supervisor and one of two project supervisors at the end of every session;

they were electronically stamped with beginning and end times for each entry. pants electronically at the end of the current Implementation phase of the Project.

First phase of Project

The first phase of the SEC-ETP project took place during the 2016-2017 school year and involved the delivery of individualised interventions to 12 students at ETP's facilities in Hermosillo, Sonora. Interventions were evidence-based educational and developmental activities structured over a play-based format, and using the processes and principles of ABA, play-based, and speech-language therapy interventions. These interventions were designed to meet the specific needs of each student as outlined in their individualised education plans (IEPs). The students received five hours of individualised intervention per day from Monday to Friday, and their parents were trained on site to provide interventions consistently across home and community settings. This pilot project was implemented to assess the feasibility of establishing an autism-specific unit where students could receive interventions and parents could be trained in the delivery of interventions first in the clinical, and subsequently in the home setting.

The instructors who provided the individualised interventions were university students from fields such as psychology, early childhood development, education, and special education who were recruited to fulfil their professional practice requirements. These instructors were supervised by experienced ETP instructors (who in the SEC-ETP Project adopted the role of Supervisors) who had received years of training in supervision and implementation by parents and other novel implementers. The recruitment of university students as instructors allowed the project to be financially viable while also providing valuable practical experience for the students. Outreach efforts were used to build working relationships with local universities and

secure the participation of future student instructors, which would enable ETP to provide services to a growing number of families.

Second phase of the Project

The second phase of the SEC-ETP Project took place during the 2017-2018 school year and included 32 students distributed across two public preschools, five elementary schools and three special education self-contained units across the municipality of Hermosillo. This phase increasingly resembled the envisioned model than the first iteration, as it included two separate autism-specialised units, one within a special-needs preschool and one within a special needs primary school, as well as support and guidance to some students and educators within regular education classroom settings in different schools across Hermosillo.

During this phase of the project, university practicum students were recruited and trained to provide individualised interventions to students, with the guidance of on-site ETP supervisors. Instructors and supervisors were also tasked with supporting and guiding the delivery of interventions by classroom teachers as needed, while adhering to each student's individualised education plan (IEP). IEPs were designed in collaboration with parents after a comprehensive assessment of the students' learning and developmental needs. During the same school year, parents of students enrolled in the project as well as educators from participating schools completed the six training units of the ETP Instructor Training Programme. In addition to parents, educators, and instructors, training sessions were attended by school maintenance personnel, administrators, and in some instances, SEC officials. Large public venues in the community were secured by SEC and ETP for these large-scale training events, with dozens of parents, educators, and administrators in attendance.

During these training events over the 2017-2018 school year, the ETP supervision team had the opportunity to train groups of parents and educators on the use of evidence-based interventions for students diagnosed with ASD on a larger scale. A total of eight supervisors managed the attendance, answered queries, and otherwise addressed concerns for all trainees. Each session began with an interactive lecture for the first four hours, followed by a two-hour workshop where parents and educators practised the delivery of specific interventions (e.g., discrete-trial format) in groups of ten to twelve participants, each guided by an ETP supervisor.

As described, simultaneous with the training was the formal delivery of interventions and support to students in school settings, and for the first time, ETP became actively involved as part of multidisciplinary teams within the public school system in the development and implementation of IEPs. Consistent with the reactions and engagement of educators during the first phase, this second phase was characterised by reports from educators in need of practical, evidence-based strategies, as well as a constructive approach to collaborative work and problem-solving.

Third phase of the Project

The third phase of the SEC-ETP Project took place from October to December of 2019 and included training sessions for parents and educators in three municipalities: Nogales, Hermosillo, and Ciudad Obregon. The training consisted of both theoretical and practical components, delivered over several sessions, and comprising six units of content. The training was held in multiple groups in each municipality, with the number of groups determined by the number of participants. In Hermosillo, there were two training groups, and in Ciudad Obregon there were two training groups, and in Nogales one training group; each group was composed of at least one hundred parents, educators, and SEC administrators. The course was delivered a total

of five times to accommodate all the parents and educators assigned by SEC to participate in the

course and the subsequent implementation phase of the project.

After the training sessions were completed, students were selected for participation in the

implementation phase of the SEC-ETP Project by SEC representatives, based on individual need

and the attendance of their parents at the theoretical training portion of the course. However, due

to the COVID-19 pandemic, the implementation phase of the project had to be redesigned to use

a telehealth format, providing guidance and support to parents while they delivered interventions

in the home setting. In Study I data collected during this phase of the project is collected and

appraised.

Fourth phase of the Project

After the beginning of the third implementation phase of the project from June to

September in 2020, an additional cohort of parents and educators was enlisted by SEC for

participation in the fourth training phase of the project. This training phase took place between

October and December of 2020. The global pandemic and ensuing lockdowns made it necessary

to deliver training in a teleconference format. While training content remained the same, the new

format required significant adaptations such as the use of an additional digital platform for

delivery of practical portions of training sessions. In attendance were a total of 93 parents and

130 educators from municipalities in Sonora. The analysis of quantitative and qualitative data

obtained before and after this fourth training phase is presented as part of Study I.

<div align="center">

Conclusions

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The ETP Instructor Training Course and the SEC-ETP Project have proven to be

successful and potentially valuable resources for individuals with ASD and their families. The

course, which was initially developed in 2013 for a small group of attendees in Hermosillo,

Sonora, has grown significantly and has been offered to hundreds of parents, educators, professionals, and university students in multiple municipalities. The course has also been adapted to meet the challenges of the COVID-19 pandemic, by adapting into a teleconference format during the subsequent fourth phase of the project.

The SEC-ETP Project has also expanded over the years to include not only individualised interventions for students with ASD, but also training and support for parents and educators to deliver these interventions in home and school settings. This comprehensive approach has been effective in helping students with ASD and their families access the support and resources they need to succeed. It was the accumulation of evidence over the years which prompted an increasingly formal, peer-reviewed, means for evaluating the implementation of this training programme on the everyday experiences and outcomes of students, parents, and educators.

The data collected during the various phases of the project will be analysed and presented in subsequent chapters and will provide valuable insights into the effectiveness of the ETP Instructor Training Course and the SEC-ETP Project in supporting individuals with ASD and their families. Overall, the ETP Instructor Training Course and the SEC-ETP Project have played a crucial role in improving the lives of individuals with ASD and their families and can continue doing so with adequate support and rigorous implementation and supervision.

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Chapter 2

Evaluation, Design and Methodological Issues

Introduction

The main roles adopted by the author include those of designer and implementer of interventions and author of this research. As a designer and implementer, the author was responsible for the design of the training programme, interventions, as well as the ability of providers of direct services to rigorously deliver them and the technologies for doing so. As a researcher, he was responsible for the account of events as well as part of the collection, analysis and interpretation of data collected for the purposes of studies I and II. Through the work on this chapter, the author aimed to better understand and be able to explain issues affecting the reliability and credibility of the involvement by the implementation and research teams, as well as the measures and contingencies adopted to maintain researcher objectivity. These issues are multiple and multidimensional, they are categorised in this work as those relevant to programme designer and implementer conduct, and those relevant to researcher conduct. Because the scope of this work is not limited to evidence presented in studies I and II, but also inclusive of the author's experience as a clinician and programme designer, the author used a risk-of-bias assessment which included the self-report of identification of conflicts of interest (COIs) during the design, implementation, and current investigation of the SEC-ETP Project. By carefully considering and addressing these issues, the author can ensure that the results of studies in this work meet their best standard for reliability and can be accurately interpreted and applied in practice. This is particularly important in the context of the SEC-ETP Project, as the goal of the project is to provide effective interventions and support for individuals with ASD and their families. By carefully evaluating the effectiveness of the training programme and interventions,

the author can help to ensure that they are having a positive impact and can be improved upon in the future.

Risk of bias

As the author has a personal, professional, and financial stake in the development of programmes that successfully deliver ABA, play (naturalistic behavioural) and speech-language-based interventions; this highlights the potential for confirmation bias to influence the design of the implementation model in the SEC-ETP Project. This is further compounded by the author's years of clinical experience, during which positive experiences may be more salient in the author's memory than negative ones. These factors may have contributed to the development of the project and the proposal and implementation of interventions based on the author's previous experiences.

In addition, the author has evidenced a preference for the collection and interpretation of quantitative data for the purposes of outcome measurement. This may have been established early in the author's training when he was first exposed to data collection practices while delivering ABA and play-based interventions. The focus on quantitative data may have also influenced the development and implementation of this research, as it was mainly quantitative data sets that were available to the author to measure outcomes from the project.

The research studies included in this work were based on the data available from the SEC-ETP Project, which was limited in scope due to the influence of biases towards specific implementation practices (ABA-based principles and technologies). Although more qualitative data was collected during the implementation of the project using technology (e.g., contact notes with narrative information about student performance during intervention sessions), the author focused on quantitative data sets to answer research questions about specific aspects such as

intensity of intervention and parent and educator ratings of instructional self-efficacy. The limitations of these choices are discussed in detail in studies I and II and should be carefully considered in the context of the risk-of-bias assessment to evaluate the adequacy of the measures selected for the study of training and intervention outcomes.

The financial and other conflicts of interest described in this chapter should be carefully considered by the reader when evaluating the author's risk of bias (RoB). These COIs may influence the validity of the methodology and implementation of the studies and should be considered when considering the results. It is important to be aware of potential biases to accurately interpret and apply the results of the studies. Notably, aligning with NSP standards, this comprehensive assessment aims to maintain the research's credibility and reliability in enhancing interventions for ASD individuals and their families.

Conflicts of interest

Conflicts of interest (COIs) can potentially impact the objectivity of the author and implementation and research teams involved in the SEC-ETP Project. COIs can be actual, potential, or perceived benefits to the author and the team (Bottema-Beutel & Crowley, 2021). To address these COIs and potential biases, the author conducted a thorough analysis of his own involvement in the development, implementation, and current investigation of the project (Figure 5). COIs were identified and categorised according to relevant categories in ASD research, including benefits to the author as the developer of the intervention and training model, current affiliations with entities that provide interventions to children or train others to do so, and the availability of a commercially available measure (Bottema-Beutel et al., 2021). The categories also included relationships of direct employment, grants to institutions associated with the author's work, consultancies, travel and speaking fees, paid expert testimony, approved, or

pending patents, stock ownership, and membership on advisory boards (Goozner et al., 2009).

These COIs should be carefully considered by the reader in the context of the risk-of-bias

assessment. They were self-identified based on biases resulting from roles engaged by the author

in this work (Figure 5).

Figure 5. Roles, potential biases, and conflicts of interest (COIs) identified by the main

researcher as a result of this work.
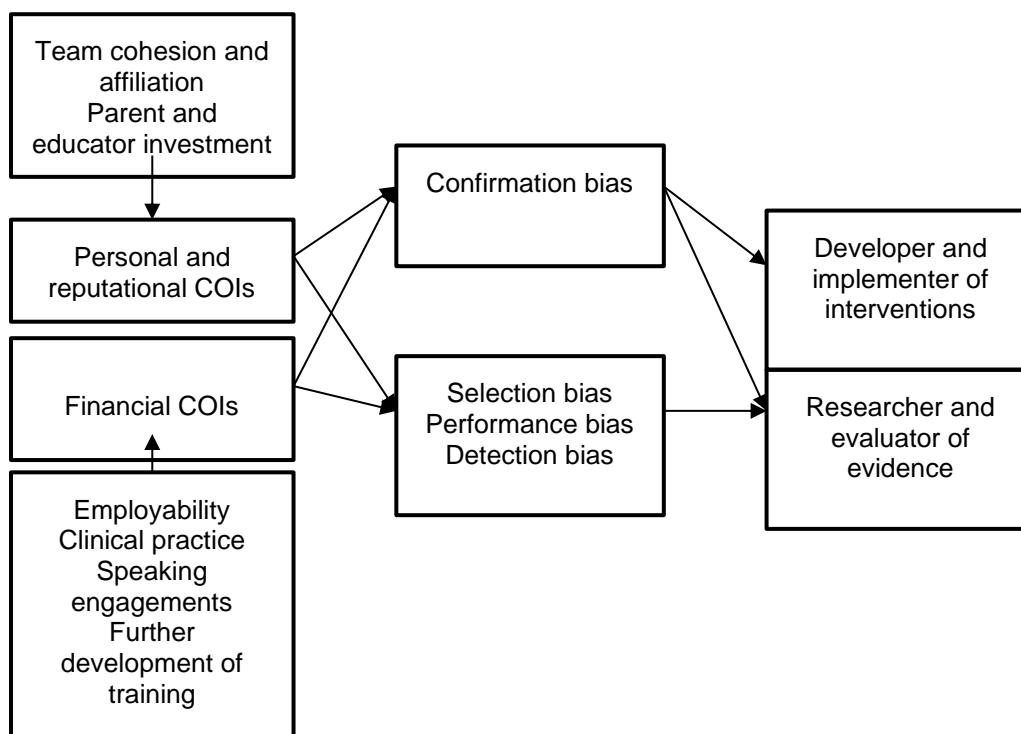
Personal and reputational conflicts of interest

Personal and reputational conflicts of interest can be a significant concern in research, as

they may influence the behaviour of the researcher and the implementation team (Bottema-

Beutel et al., 2021; Bottema-Beutel & Crowley, 2021). In the case of the SEC-ETP Project, the

author had a personal and professional investment in the development and implementation of the

interventions, as well as in the publication of this work as a doctoral thesis. This investment and

the development of personal relationships and loyalties over the course of the project may have

contributed to a confirmation bias, which could have affected the stakeholders' willingness to adhere to the intervention models and to present the project in a positive light (Dawson & Fletcher-Watson, 2021). It is important to carefully consider and address these conflicts of interest to adequately appraise the credibility and reliability of findings reported in this work.

Financial conflicts of interest

The potential for reputational and financial gain from the publication of this doctoral work should be considered when evaluating the validity of the intervention and training programmes described. These potential benefits could include increased opportunities for employment in research and academia, as well as financial compensation for this type of work (Dawson & Fletcher-Watson, 2021). In addition, the author's affiliations with institutions that provide training and intervention services to children with developmental disabilities, parents, and educators could lead to increased opportunities for clinical work and employment sustainability (Goozner et al., 2009). For other stakeholders, such as individuals receiving interventions at clinical sites and their families, this could potentially result in increased access to intervention services at no cost, as well as an increase in the number of families receiving scholarships for intervention services from ETP.

The author's potential financial benefits may also include paid speaking engagements, including presentations in public forums, conferences, and opportunities to present or implement the training programme described in this work (Bottema-Beutel & Crowley, 2021). These opportunities often include costs for travel, lodging, and other associated expenses. Additionally, the author is the sole developer of *therapyConnect*, and as such, could potentially benefit from its commercialisation. While this software has not yet been monetised, a professional or researcher version could potentially be sold to educational and therapeutic institutions.

These financial conflicts of interest and associated biases should be considered when evaluating the author's behaviour as a programme developer and implementer, as well as an author of this research. As a programme developer, such influences may have resulted in adherence to previously successful interventions and a focus on collecting and interpreting quantitative data for the purposes of outcome measurement. As an implementer, these conflicts may have influenced the author's relationships with team members, parents, and educators, as well as his decisions about which data to include in this research.

Conclusion

In this research, the author served as both the designer and implementer of interventions, as well as the appraiser of evidence from this research. As the designer and implementer, the author was responsible for the design of the training programme and interventions, as well as ensuring that providers were able to deliver the interventions rigorously and using appropriate technologies. As the researcher, the author was responsible for the account of events and the collection, analysis, and interpretation of data collected for studies I and II. The author's goal in this chapter was to better understand and explain the issues affecting the reliability and credibility of the involvement of the implementation and research teams, as well as the measures and contingencies put in place to maintain researcher objectivity. These issues are categorised as those related to the conduct of the program designer and implementer, and those related to the conduct of the researcher.

The author used a risk-of-bias assessment that included self-report identification of conflicts of interest (COIs) during the design, implementation, and investigation of the SEC-ETP Project. The author has a personal, professional, and financial stake in the success of programs that deliver ABA and play and speech-language-based interventions, which could potentially

lead to confirmation bias influencing the design of the implementation model in the SEC-ETP

Project. The author also has shown a preference for collecting and interpreting quantitative data

for the purposes of outcome measurement, which may have influenced the development and

implementation of the research. The studies in this work were based on the data available from

the SEC-ETP Project, which was limited due to the influence of biases towards specific

implementation practices. The limitations of these choices are discussed in studies I and II and

should be considered in the context of the risk-of-bias assessment to evaluate the adequacy of the

measures selected for the study of training and intervention effectiveness.

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Chapter 3

Literature Review

Parent-delivered evidence-based interventions (EBIs) for preschool and school-age children

diagnosed ASD

Introduction

Effective evidence-based intervention (EBI) programmes for school-age children diagnosed with autism spectrum disorder (ASD) are labour-intensive (Ganz, 2007). They require considerable amounts of individualised attention and the expertise of clinician experts who can provide useful advice on the maintenance of relevant and effective interventions (Jacobson et al., 1998). This need for high-intensity intervention programmes for school-age children with ASD has been widely documented (Jacobson, 2000), as have the obstacles for their design and delivery (Ganz, 2007). Active parental involvement has been identified as an important factor in intervention outcomes (McConachie & Diggle, 2007), and there is evidence that parents and educators can be trained and guided to deliver evidence-based interventions (EBIs) in home and school settings (Kasari et al., 2021; Parsons et al., 2016). The current literature review explores the interventions and outcomes of children/students, parents, and educators from studies regarding parent- and educator-delivered ABA, play-based, and speech and language interventions.

Autism spectrum disorder (ASD)

According to the latest and fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5 (American Psychiatric Association, 2013), an individual can be diagnosed with ASD if they have "persistent deficits" in three areas of social communication including reciprocity, comprehension and use of nonverbal communication, and difficulties

establishing and maintaining social relationships. The individual must also display at least two of four stereotypical behaviour patterns including stereotyped or repetitive movements, insistence on sameness, persistence on certain topics or themes, or hyper/hypo reactivity to specific stimuli (e.g., high pain thresholds, sensitivity to loud noises or specific sounds). The final diagnostic category specifies that the onset of symptoms occurred early in development, that "symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning," and that the symptoms are not explained by other categories of disability such as cognitive delay (American Psychiatric Association, 2013).

The identification of autism spectrum disorder by the medical and scientific establishment has evolved over the past century. In the early 1900s, cases of individuals with this symptomatology emerged in clinical literature, although it is likely that the condition has existed among members of the human population for much longer (Verhoeff, 2013). Around such a period Eugen Bleuler used the term "autistic" to describe symptoms in individuals diagnosed with schizophrenia who displayed impairing levels of "social disconnection" and "insistence on sameness" (Peralta & Cuesta, 2011; Verhoeff, 2013). The term was later applied by researchers such as Leo Kanner (1943) to populations of children with this symptomatology. At the time, the word "autism" was used to describe symptoms related to the diagnosis of "schizophrenic reaction, childhood type" in the first edition of the DSM in 1952 and to the diagnosis of "schizophrenia, childhood type" in the second edition of the DSM published in 1968. It was not until the publication of the third edition of the DSM in 1980 that a separate diagnosis for infantile autism was added under the new category of Pervasive Developmental Disabilities (PDDs). During this period, the diagnosis of autism was defined as infantile autism of active or residual state. The "active state" referred to children exhibiting symptoms, while "residual"

referred to those who displayed symptoms early in development but did not meet the diagnostic criteria later in life (Volkmar, 2013). This diagnosis listed a lack of interest in people, severe impairments in communication, and bizarre responses to the environment with an onset of symptoms before the age of 30 months as its essential features. It also included a separate category of Specific Developmental Disorders (SDCs) for conditions that impaired the development of language and social skills, including attention, perception, reality testing, and motor impairments. This diagnosis was reserved for those with such impairments without infantile autism as an identified cause. The addition of this new category of disorders and diagnosis brought a different framework for the design, testing, and delivery of interventions for autistic individuals.

Aetiology of Autism Spectrum Disorder (ASD)

Even though some of the neurological disruptions characteristic of ASD have been identified, they remain to be fully understood (Rogers, S. J., 1998). Recent studies have suggested structural abnormalities in brain structure, such as disrupted connections between brain areas (Nickl-Jockschat et al., 2012), differences in cerebral mass compared to neurotypical individuals (Sacco et al., 2015), and hypoactivation of specific cortical regions (Di Martino et al., 2009). The origin of these disruptions is not yet clear to the medical and research establishment; however, there are genetic and environmental factors which have been found associated with the presence of ASD. Studies have identified a number of genetic mutations and variations that are associated with an increased risk of ASD, including copy number variations (Sebat et al., 2007) de novo mutations (O'Roak et al., 2012), and rare inherited genetic variants (Bonora et al., 2014). Environmental exposures during critical periods of development may also contribute to the neurological aetiology of ASD (Modabbernia et al., 2017). For example, studies have found

that exposure to toxins or pollutants, such as lead or pesticides, during pregnancy or early childhood may increase the risk of ASD (Grandjean & Landrigan, 2006; Windham et al., 2006). Other environmental factors that have been associated with an increased risk of ASD include infection during pregnancy (Jiang et al., 2016), prenatal stress (Scibelli et al., 2021), and low birth weight (Lampi et al., 2012). These environmental exposures may disrupt the normal development of the brain and increase the risk of ASD.

Prevalence of ASD

According to the Center for Disease Control and Prevention (CDC), the prevalence of autism spectrum disorder (ASD) has increased significantly over the last decades. In the United States, the prevalence of ASD among children aged 8 years increased from 1 in 150 in 2000 to 1 in 44 in 2021 (Maenner et al., 2021). This trend has been observed in other countries as well, with some studies reporting even higher prevalence rates (Pantelis & Kennedy, 2016).

There are several factors that may contribute to the rising prevalence of ASD. One possible factor is increased awareness and recognition of ASD by healthcare professionals and the public. In the past, ASD may have been underdiagnosed or misdiagnosed due to a lack of understanding or awareness of the condition. As the knowledge and understanding of ASD have increased, more children with ASD may be receiving accurate diagnoses and appropriate interventions.

Another possible factor is changes in the diagnostic criteria for ASD. In 2013, the DSM-5 (American Psychiatric Association, 2013) revised the diagnostic criteria for ASD, which may have resulted in more children being diagnosed with the condition. The DSM-5 criteria are broader and more inclusive than the previous DSM-IV criteria, which may have led to an increase in the number of children who meet the criteria for ASD.

Additionally, as described, environmental factors, such as exposure to toxins or pollutants, may also play a role in the rising prevalence of ASD. However, more research is needed to fully understand the potential role of environmental factors in ASD. There also have been debates and controversies about the potential role of other factors, such as vaccines, in the rising prevalence of ASD. Some studies have suggested that vaccines may increase the risk of ASD, while others have reviewed this evidence and found them safe (DeStefano & Shimabukuro, 2019). However, this research has come under scrutiny over the last few years (Kern et al., 2017), as we continue learning about environmental risk factors that play a role in ASD.

Other perspectives on ASD and the social model of disability

The author recognises there are other frames of reference beyond the medical model through which individuals, families, educators, and readers refer to and use the term autism. An example of this is the neurodiversity movement, which views autism as a neurological difference rather than a disorder and therefore should not be subjected to behavioural change. This often includes individuals who identify as autistic but may not have been diagnosed by a medical professional and may even be reluctant to do so. The goal of this research is not to take a stance on the medical versus non-medical perspectives of conceptualising autism, but rather to provide a specific frame of reference in which autism is defined and used by the author in this work. It is within this medical framework that the author refers to ASD, populations of autistic individuals or autistic traits, and how terms such as 'autism' and 'ASD' are defined and addressed. Notably, this criteria includes "clinically significant impairment in social, occupational, or other important areas of current functioning" as a consequence of the diagnosable symptomatology (American Psychological Association, 2013). Only after meeting this criteria a diagnosis of ASD can be

attributed, even if symptoms from other diagnostic categories are present (e.g., presence of repetitive and restrictive behaviours); this means that individuals diagnosed with ASD, including the participants in the studies discussed in this work, experience significant difficulties in carrying out activities of daily living due to their symptoms, often requiring multiple forms of intervention and support from early childhood and in many cases throughout their lifetime.

As our understanding of ASD has evolved and interacted with our growing knowledge of EBIs and how to effectively deliver them, our focus has—albeit slowly—shifted away from an institution-centred model of intervention toward a definition of disability that is fair, adequate, and productive for individuals, their families, and the communities in which they live. Under a social model of disability, impairments, including those in ASD, are seen as the gap between an individual's abilities and society's ability to meet those abilities for the individual to fully participate in and enjoy their community (Oliver, 2013). Within this framework, the author, and the implementation teams he has been a part of have designed, delivered, and evaluated the implementation of EBIs, including the interventions discussed in this work. This process involved a comprehensive evaluation of each student's learning skills and an understanding of their personal and environmental needs and involved training parents and educators on the conceptualization and application of EBIs. This allowed for an environment in which difficulties in communication and adaptive behaviour were seen as an opportunity for parents and educators to shape the nature of their interactions with their students or children through engaging them in socially valid and relevant EBIs.

Building an evidence-based intervention programme

Building an evidence-based intervention programme involves considering a spectrum of biomedical and non-biomedical approaches designed to support individuals with ASD.

Biomedical interventions encompass treatments involving medications or medical procedures, while non-biomedical interventions entail therapies excluding medications or medical procedures.

The National Autism Centre's National Standards Project (NSP) is a highly reputable initiative evaluating and advocating evidence-based interventions for individuals within the autism spectrum. Conducted by the National Autism Centre in America, this project meticulously reviews peer-reviewed studies, assessing intervention effectiveness tailored for children and young individuals with ASD. Using a Strength of Evidence Classification System, the NSP rigorously scrutinizes the quality of peer-reviewed studies, establishing guidelines based on a comprehensive analysis of these interventions. The NSP played a significant role within this literature review, particularly in examining evidence-based interventions (EBIs) for ASD. Its meticulous assessment and establishment of evidence-based practice guidelines have significantly influenced the landscape of interventions available for individuals diagnosed with ASD. Integrating NSP's findings and recommendations, this literature review aims to spotlight effective intervention strategies, their impacts on children/students, parents, and educators, and the broader implications for ASD interventions in home and school settings. One example of a biomedical intervention for ASD is the use of pharmacotherapy, often used to address emotional and behavioural symptomatology (Goel et al., 2018; Wink et al., 2010) Antipsychotic medications, such as risperidone and aripiprazole have been shown to be effective in reducing irritability and aggressive behaviour in individuals with ASD (Aman et al., 2002). Other medications that have been used to treat symptoms of ASD include selective serotonin reuptake inhibitors (SSRIs) for anxiety (Williams et al., 2013), stimulants for attention deficit

hyperactivity disorder (ADHD) (Rodrigues et al., 2021), anticonvulsants for comorbid seizure disorders (Watkins et al., 2022) and for behavioural disturbances (Comai et al., 2012).

In addition to biomedical interventions, there are also a variety of non-biomedical interventions that have been developed to help individuals with ASD. One example of a non-biomedical intervention is behavioural therapy. Behavioural therapy involves the use of positive reinforcement and other techniques to help individuals with ASD learn new skills and reduce challenging behaviours. A commonly used behavioural therapy for ASD is applied behaviour analysis (ABA), which has been shown to be effective in improving social communication and adaptive behaviour in individuals with ASD (Matson et al., 2007; Paynter et al., 2018). Other non-biomedical interventions for ASD include speech and language therapy (Rogers et al., 2006), occupational therapy (Goin-Kochel et al., 2007), and social skills training (Bellini & Peters, 2008).

Applied behaviour analysis (ABA) interventions

Applied behaviour analysis (ABA) interventions are a set of tools, programs, or processes based on the principles of behaviourism that are applied to teach socially important behaviours (Baer et al., 1968). These interventions have been extensively researched in the treatment of conditions such as ASD, depression, anxiety, addiction, and behavioural (Roane et al., 2016; Simpson et al., 2017). The concept of ABA interventions originated in the United States in the early 20th century through the work of researchers such as James Watson and Ivan Pavlov (Kirkham, 2017). In 1953, B.F. Skinner published *Science and Human Behavior*, which described the application of concepts like operant behaviour, shaping, operant discrimination, and punishment to human behaviour (Skinner, 1953). In 1958, the *Journal of Experimental Analysis of Behavior* (JEAB) was created to publish research in this field, including in its first

edition studies on the use of extinction in young children (Bijou, S. W., 1958), the effects of different reinforcement schedules on response rates (Hearst, 1958), and the use of discriminative stimuli and reinforcement to control behaviour (Skinner, 1958). In 1967, the *Journal of Applied Behavior Analysis* (JABA) was created to publish further research in this area, including studies on punishment to suppress behaviour (Risley, 1968), about behavioural and applied behavioural research (Baer et al., 1968), and the use of reinforcement strategies by parents in the home (Hart et al., 1968). Since the early autism intensive-intervention studies in Washington and California (Bijou, Sidney W., 1961; Lovaas, 1987), ABA interventions have become available worldwide and have been established in graduate programs, research groups, and parent-led support and advocacy efforts (Hawkins et al., 1993). Currently, as described, ABA interventions are widely used in the treatment of ASD and have been shown to be effective in improving social communication, adaptive behaviour, and cognitive skills in individuals with ASD. However, it is important to consider that composition of ABA-based intervention programmes often significantly vary between individuals (Bauman, 2010), and that they need to be tailored to the individual's capacities and context (Greenspan & Wieder, 1999) to develop effectively individualised interventions. It is also recommended to work with a team of professionals, including doctors, therapists, and educators, to develop a plan that meets the specific needs and goals of the individual with ASD.

There are several factors that have potential significant effects on the adoption of ABA interventions by individuals with ASD, their families, and educational systems. One key factor is the research evidence supporting the effectiveness of ABA interventions. Another factor is the flexibility of ABA interventions, which can be tailored to meet the specific needs and goals of everyone with ASD. This allows for a high degree of personalization, which is essential for

addressing the diverse needs of individuals with ASD. Additionally, ABA interventions are often highly intensive, which can be necessary to address the significant challenges faced by individuals with ASD. This intensity can be a challenge for families and educators to manage on their own, and as a result, training and support for parents and educators to deliver ABA interventions is often provided. This can be in the form of professional training programs or guidance from ABA therapists and other professionals. Furthermore, the high cost of these interventions has led to public policy which often negatively affects their adoption by public education and health systems.

The author uses in this work a framework of ABA based on the classification of ABA interventions offered by Boutot and Hume (2012). Under this framework interventions were categorised as antecedent-based, instructional, or consequence-based. Identified antecedent-based interventions include *behavioural momentum*, *choice*, *environmental modification*, *errorless teaching*, *incorporating student interest*, *priming*, *task interspersal*, *time delay* and *visual prompting*. Instructional interventions include *chaining*, *discrete trial training*, *functional communication training*, *incidental teaching*, *modelling*, *pivotal response treatment*, *prompting*, *shaping*, *task analysis.* Consequence-based interventions include *contingency contracting*, *delayed contingencies*, *differential reinforcement*, *extinction*, *response interruption*, *redirection*, *reinforcement*, *token economies*.

Play-based interventions

One type of EBI for ASD is play-based interventions, also known as naturalistic developmental behavioural interventions (NDBIs) or child-led interventions (Dijkstra-de Neijs et al., 2021). These interventions use the child's interests as the basis for delivery of behavioural interventions in naturalistic or play-based environments, and involve the application of

behavioural analytic principles, processes, and interventions (e.g., task analysis, reinforcement, prompting, shaping) to address specific personal and environmental factors that impact play-related skill repertoires (Dijkstra-de Neijs et al., 2021). NDBIs have been found to be effective in improving a range of play-related skills and behaviours, including motor control, imitation skills, joint attention, imitation, and symbolic play, and in generalising skills acquired in other environments (Waddington et al., 2021). In terms of environmental factors, NDBIs have been shown to have positive impacts on parent behaviour (Mahoney & Solomon, 2016) as well as on parental stress and efficacy (Estes et al., 2019; Shire et al., 2016).

Well-established models of parent-implemented, child-led, play-based interventions that have been supported by research include the Developmental, Individual Differences, and Relationship-based model *DIR-Floortime* (Greenspan, Stanley & Wieder, 2008), the *Early Start Denver Model* (ESDM) (Rogers & Dawson, 2010), the *Joint Attention, Symbolic Play, Engagement, and Regulation intervention* (JASPER) (Kasari et al., 2021), and *Pivotal Response Training* (PRT) (Koegel & Koegel, 2006). There are also therapist-implemented, play-based interventions for children with ASD. These interventions typically involve a therapist leading the play activities and using behavioural principles to target specific skills and behaviours. For example, the *Play and Language for Autistic Youngsters* (PLAY) intervention involves the therapist leading structured play activities and using prompts and reinforcement to encourage social communication and language use (Solomon, 2016).

Speech-language therapy interventions

Speech-language interventions are a commonly used non-biomedical intervention for school-age children with ASD all over the world. These interventions aim to improve communication skills, including expressive language (i.e., the ability to produce speech or other

systems of symbols to convey meaning), receptive language (i.e., the ability to understand language), and social communication (i.e., the ability to use language for social interactions). Speech-language interventions may involve a variety of techniques, such as verbal behaviour therapy, social skills training, and augmentative and alternative communication (AAC) strategies (e.g., sign language, picture symbols). Notwithstanding, there is still much to do in regard to equipping speech and language therapists to adequately address the symptomatology of ASD (Vitásková & Říhová, 2012).

Studies have shown that speech-language interventions can be effective in improving communication skills in individuals with ASD (Adams et al., 2012) and have been documented as the primary type of intervention sought by parents after an ASD diagnosis. For example, earlier studies have assessed the use of theory of mind (ToM) training to enhance social communication skills (Ozonoff & Miller, 1995), and of play-based interventions to increase speech intelligibility (Hoque et al., 2009). The use of augmentative and alternative communication (AAC) strategies, such as picture symbols and other forms of aided communication have been widely researched in the context of ASD social communication interventions (Ganz, J. B., 2015).

Delivery of interventions by parents in the home setting

Active parental involvement has been identified as a key factor in the success of interventions for children with ASD (Chaidi & Drigas, 2020). This is particularly true for evidence-based interventions (EBIs), which often require a high level of intensity in order to be effective (Linstead et al., 2017). In many cases, the frequency of traditional interventions is not sufficient to meet the needs of children with ASD, and parents may need to learn how to deliver EBIs in their home in order to provide the necessary intensity (Chaidi & Drigas, 2020). Parents

as interventionists also allows for a more personalised approach, as they become increasingly able to tailor interventions to their child's specific needs and preferences (Steinbrenner et al., 2020).

There are also several challenges to training parents to deliver interventions in their home. One challenge is the time and effort required for parents to learn and implement the interventions. Another challenge is the potential for parents to experience feelings of stress, frustration, or burnout as they try to balance the demands of parenting with the demands of delivering interventions (Schreibman & Ingersoll, 2005). It is important for professionals working with families of children with ASD to provide support and guidance to parents as they learn to deliver interventions in their home, and to consider the needs and limitations of individual families when designing interventions.

Delivery of interventions by educators in the school setting

Children with ASD often require specialised support and accommodations to be successful in all relevant environments (Davidson, 2010). Educators play a crucial role in providing this support and training them to deliver evidence-based interventions (EBIs) can be an effective way to improve outcomes for these students. In addition, research has shown that training teachers to use visual supports, such as schedules and picture symbols, can be an effective way to improve communication and behaviour in children with ASD (Barker et al., 2013). Training teachers to use these types of strategies can help to create a more structured and predictable environment for students with ASD, which can facilitate their learning and socialisation (Nunes et al., 2021).

There are several reasons why training educators to deliver interventions in the school setting can be beneficial for children with ASD. First, it allows for a more consistent and

structured approach to intervention, as educators can deliver interventions in a classroom setting (Morrier et al., 2011). Second, it allows for a more naturalistic environment, as interventions can be delivered within the context of the child's everyday school routine (Schreibman & Ingersoll, 2005). Third, it allows for a more collaborative approach, as educators can work with parents and other professionals to develop and implement interventions that meet the needs of individual students.

There are also several challenges to training educators to deliver interventions in the school setting. One challenge is the time and effort required for educators to learn and implement the interventions (Morrier et al., 2011). Another challenge is the potential for a lack of resources or support within the school setting, which can make it difficult for educators to deliver interventions consistently (Schreibman & Ingersoll, 2005). It is important for professionals working with children with ASD in the school setting to provide support and guidance to educators as they learn to deliver interventions, and to advocate for the necessary resources and support to ensure the success of these interventions.

Methodology

Rationale for review

Interventions tailored for school-age children diagnosed with ASD often demonstrate positive and enduring outcomes, particularly at high intensities. However, the substantial investment of time and resources necessary for designing and implementing these interventions is notably challenging. Compounded by the diverse and multifaceted nature of ASD symptomatology (Bruining et al., 2010), this challenge becomes more complex. To address this, the National Autism Centre's National Standards Project (NSP) serves as a guiding framework, offering crucial insights into evidence-based interventions (EBIs) for ASD. Considering the

NSP's rigorous evaluation and promotion of interventions, this review aims to explore solutions to the delivery of high-intensity EBIs by emphasizing the training and support of parents and educators. Facilitating their engagement in the delivery, ongoing monitoring, and adaptation of interventions to evolving learning needs and environmental factors forms a critical aspect of this approach. Despite the acknowledged relevance of parent and educator training in home and school settings, research in these domains is continuously evolving. This review provides an analysis of recent studies focusing on parent and educator-delivered interventions within the realms of ABA, play-based, and speech and language-based approaches.

Aim of review

This literature review aims to provide a frame of evidence for the interpretation of results obtained in the studies subject of this work. This is presented through an analysis of studies on parent and educator delivered EBIs in home and school settings, as well as their outcomes and those of represented children/student participants. The frame of evidence presented is a product of the answers to the following research questions:

1. What evidence-based ABA, play and speech-language interventions have been used to train parents and educators for their delivery in home and school settings?

2. What were the outcomes for children/students involved in these studies?

3. What were the outcomes for parents and educators involved in these studies?

Review scope and structure

The present is a systematic review and critical analysis of a collection of randomised-controlled trials (RCTs) published between 2012 and 2022 which have assessed parent and educator training programmes for delivery of EBIs in home and school settings. This review focuses on three specific types of intervention: (1) applied behaviour analysis (ABA)-based

interventions; (2) naturalistic or play-based interventions; and (3) speech and language therapy interventions.

Methods and search strategy

Five areas of research were addressed through six databases. Areas and databases targeted childhood development (Child Development and Adolescent Studies and ERIC through EBSCO), autism spectrum disorder journals (APA PsycInfo through Ovid), allied health (CINAHL through EBSCO), childhood education (British Education Index through EBSCO) and medical journals (Medline through EBSCO). Extraction of articles related to parent training was used via the boolean string "(autism OR ASD OR autism spectrum disorder OR autistic OR pervasive developmental disorder OR aspergers) AND (aba or applied behavio* analysis or aba therapy OR play based OR play-based OR play intervention OR speech therapy OR speech and language therapy OR speech and language intervention OR speech language therapy) AND (parent training OR parent education OR parent coaching OR parent-implemented OR parent-mediated)". Extraction of articles related to educator training was used via the boolean string "(autism OR ASD OR autism spectrum disorder OR autistic OR pervasive developmental disorder OR aspergers) AND (aba or applied behavio* analysis or aba therapy OR play based OR play-based OR play intervention OR speech therapy OR speech and language therapy OR speech and language intervention OR speech language therapy) AND (educator training OR teacher education OR educator coaching OR educator-implemented OR educator-mediated)". Selection of articles was guided using the PRISMA guidelines (Page, 2021) and is shown in figure 6.

Study selection criteria

Studies that met the following criteria were selected for review: (1) studies included at least 20 child/student participants who were pre and primary school-age children diagnosed with ASD; (2) interventions were delivered by parents or educators in home or school settings; (3) interventions were ABA, play-based, or speech-language based; and (4) studies were randomised controlled trials (RCTs).

Randomised controlled trials (RCTs) are a type of study design that is widely considered the gold standard for evaluating the effectiveness of interventions. RCTs involve randomly assigning individuals to receive either the intervention being tested or a control condition, and then comparing the outcomes between the two groups. This type of study design helps to minimise bias and support the internal validity of the study, as it reduces the likelihood that any observed differences between the two groups are due to factors other than the intervention being tested (Hariton & Locascio, 2018).

As described, RCTs provide the strongest evidence for determining the effectiveness of an intervention. This is particularly important when evaluating interventions for autism, as there are many potential confounders that could affect the outcomes of a study, such as age, IQ, or comorbid conditions (Bauman, 2010). Using RCTs researchers are able to control for these and other extraneous variables that may influence the outcomes of a study. When uncontrolled, these variables can make it difficult to determine whether any observed differences between the intervention and control groups are due to the intervention itself or other factors. RCTs on the other hand, can help to control for these types of variables by randomly assigning participants to the different study groups. Because of this, RCTs are more reliable than other types of studies when it comes to making causal inferences (Hariton & Locascio, 2018). Overall, RCTs are a powerful tool for evaluating the effectiveness of interventions, particularly in the field of autism.

While there are other types of study designs that can also provide valuable information, RCTs are often considered the most reliable and provide the strongest evidence for identifying the 'active ingredients' of an intervention. This rigorous methodology aligns with NSP's meticulous assessment of evidence-based practices, ensuring a comprehensive and robust review of interventions for ASD in the context of parent and educator-delivered strategies.

Table 1. Inclusion criteria and rationale for selected studies.

Inclusion criteria	Rationale
Studies which evaluated randomised controlled trials (RCTs).	RCTs are considered one of the highest standards of evidence regarding populations of school-age children with ASD. RCTs in ASD research tend to reflect the variety of interventions other models with lesser degree of control have also investigated.
Parents or educators needed to be trained to deliver interventions in home and school settings.	The focus of studies in this work is on parent and educator training for delivery of EBIs in home and school settings, where intervention delivery is subject to a different set of variables.
Child participants of pre or primary school age.	This age range is consistent with that of children participants in studies subject of this work (chapters 8 and 9).
Interventions which implicitly or explicitly included the use of ABA, play-based, or speech-language interventions.	Due to the nature of the core characteristics of ASD, ABA, play-based and speech-language interventions have provided in recent decades substantial evidence of intervention effects. This is also the scope of interventions parent and educator participants included in studies in this work were trained to deliver.
At least 20 children were included in the study.	The obstacles of studying large cohorts of children diagnosed with ASD have for a long time prevented large-scale studies from becoming the norm. It has also been suggested that the cumulative evidence offered by small and medium-sized, well-controlled studies is relevant and significant.

The initial search yielded a total of 223 studies, from which a further 59 were identified via initial screening of abstracts, most excluded studies at this stage were uncontrolled trials, participants were outside the target age range or sample size for children participants was below 20. After further detailed review of these studies 15 were selected for inclusion in the present

review. Two studies were included because of other searches or references from articles found through this search. In comparison, a cursory search for clinician-delivered interventions in the same databases yielded 25 RCTs.

Figure 6: Prisma diagram of identification process of selection of studies for inclusion in the current review.
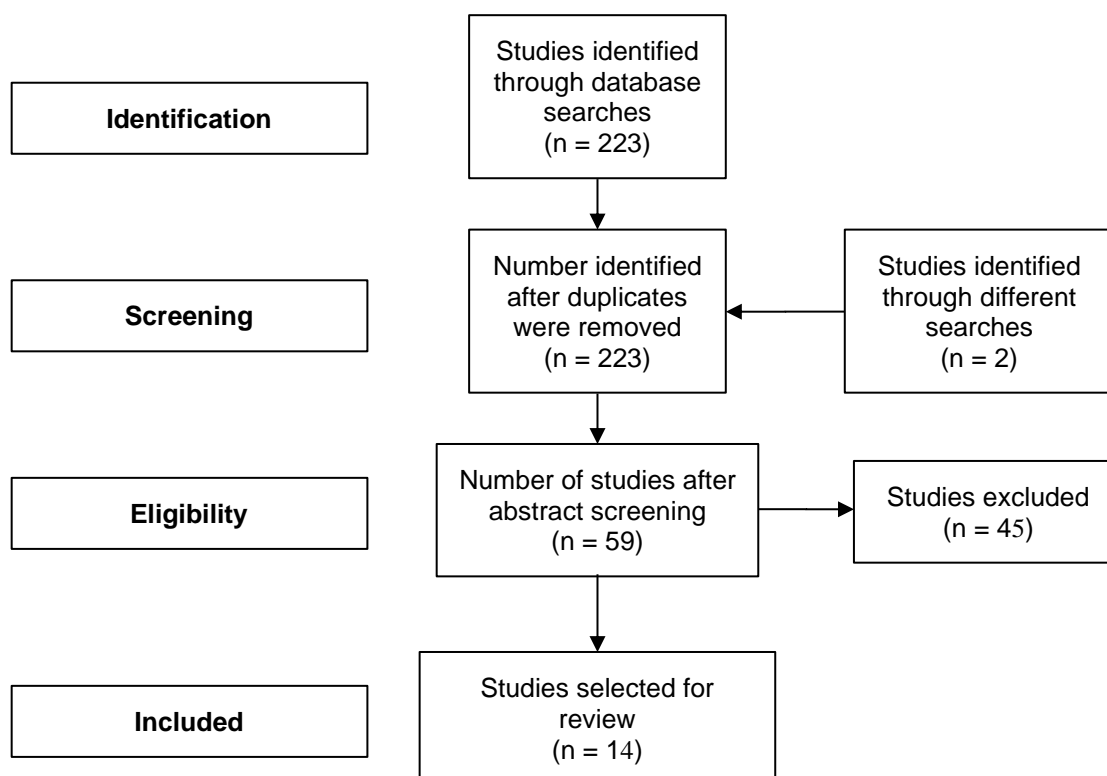
Findings

General description of studies

The following provides a general overview of the studies incorporated in this review. It offers a summary of participants, followed by brief descriptions of applied interventions, delivery methods, and summaries of outcomes for children/students, parents (NSP Consideration: Primarily those involved in parent training), and educators (NSP Consideration: Particularly those involved in educator training). Tables in both appendices outline the measures and outcomes documented by each study.

Studies on parent-delivered interventions

The nine studies regarding parent-delivered interventions represented a total of 539 children (M = 67.38, SD = 34.53); the sample of 112 children participants in the Mahoney et al. (2016) study were not included in this calculation as they belong to the same subject pool from the Solomon et al. (2014) study. Children participants ranged in age from two to seven years of (M = 39.75 months). Percentage of female child participants across these studies was 19.35%.

Hardan et al. (2015) investigated the impact of parent-delivered Pivotal Response Training (PRT) on 27 children with ASD over 12 weeks. Parent training involved eight sessions lasting 90 minutes in group settings, followed by four individual sessions lasting 60 minutes. The control group of 26 children received psychoeducation intervention for 12 weekly sessions, evidencing significant effects on various measures but not on all outcomes (NSP Consideration: Outcomes aligned with NSP's assessment criteria).

Lindgren et al. (2020) evaluated the effectiveness of parent-delivered Functional Communication Training (FCT) intervention in reducing problem behaviour and increasing spontaneous verbal requests in children with ASD. They compared the results of 21 children and

their parents, who received training on delivering FCT, to a 12-week delay control group of 17

children and parents. During this initial period the control group received treatment-as-usual

interventions, including speech and occupational therapy, educational, dietary, and social skills

interventions, as well as pharmacological and behaviour intervention plans applied in home and

school settings. The control group also received monthly coaching sessions via telehealth with

behavioural consultants, during which they were guided on conducting extinction sessions. The

study detected a significant intervention effect on increased verbal requests and decreased

disruptive behaviour (NSP Consideration: Focused on critical behavioural aspects). Parental

acceptability was reported to be high in both groups.

Two studies evaluated the outcomes of a group of 128 children and their parents who

participated in the PLAY Project Home Consultation Programme (Solomon et al., 2014;

Mahoney et al., 2016). In the first study 57 children were assigned to the intervention group

while 55 children were assigned to the control group. The intervention group received monthly

visits for a one-year period, each lasting three hours, with parents suggested but not required to

review orientation materials about the PLAY programme. The control group received treatment-

as-usual interventions, including public special education preschool services, which consisted of

4-5 weekly half days of educational instruction. Solomon et al. (2014) found that children in the

intervention group were more likely to be adjudicated a category of less severity from the

ADOS-G, even though there were no significant effects from interventions on standardised

severity scores. However, no treatment effects were evidenced by standardised testing of

developmental skills, receptive or expressive language. Significant treatment effects were

detected on levels of parent depression, but no treatment effects were noted for levels of parental

stress. In a subsequent analysis of data from participants in the Solomon et al. (2014) study,

Mahoney et al. (2016) found significant treatment effects on scores of social engagement and emotional functioning (NSP Consideration: Assessment of social engagement and emotional well-being). No significant effects were evident for repetitive and restrictive behaviour (RRB) scores or total ADOS calibrated severity scores (CSS) scores. A large treatment effect was also detected on responsive behaviour by parents, which had a significant mediation effect on child outcomes.

Manohar et al. (2019) assessed the effectiveness of parent training in the delivery of "family friendly behavioural strategies" (NSP Consideration: Alignment with NSP criteria on effective strategies), which they defined as the application of a developmental approach to the development of "joint attention, imitation, social, and adaptive skills" (Manohar, 2019, p.3146). They compared the outcomes of 26 children and their parents to those of 24 in a control group. The training consisted of five sessions, including assessment, parent education, addressing stress from a cultural perspective, intervention, follow-up, intervention review, and continued support. The control group received treatment as usual, which included monthly visits to each child's assigned physician and referrals for speech and language, occupational, and pharmacological intervention as needed. Significant treatment effects were detected on total CARS severity scores. However, statistically significant improvements were only found for the subitem scores of relating to people, imitation skills, visual response, listening response, and non-verbal communication. Fidelity of delivery of interventions and parents' adherence to the program were reported as high. Treatment effects were noted in significant positive changes in measures of parent stress, distress, use of coping strategies, knowledge of techniques, and perceived competence.

In their study, Rogers et al. (2012) evaluated the effects of a parent-delivered version of the Early Start Denver Model (ESDM) in 98 children with ASD between the ages of 14 and 24 months. The intervention group received 12 one-hour training sessions delivered by specialists over a three-month period, while the control group received community interventions. The ESDM training curriculum included opportunities for instruction, modelling, and feedback. While there were no significant effects of treatment on standardised measures of early development, receptive and expressive language, or ADOS severity scores, treatment did have a significant effect on parent ratings of their working alliances with therapists. Both groups of parents showed a significant increase in the use of ESDM strategies, with no significant difference between the groups (NSP Consideration: Noted effects on parental relationships).

Two studies assessed caregiver-delivered implementation of the Joint attention, symbolic play, engagement, and regulation intervention (JASPER) model. Shire et al. (2016) evaluated the outcomes of 43 children (mean age of 31 months) over a ten-week period. Caregivers received training on delivery of JASPER interventions, and their outcomes were compared to those of 42 children whose caregivers participated in an alternative parent education program. Treatment effects were evident on levels of children's joint engagement (NSP Consideration: Focused on joint engagement). Treatment effects were also noted on parents' responsive behaviour and adoption of JASPER strategies. The second RCT within the scope of this review which evaluated the implementation of JASPER intervention by Hampton et al. (2020) evaluated the outcomes of a parent-delivered "multi-component communication intervention" which included the use of Discrete Trial Teaching (DTT), JASPER, Enhanced Milieu Teaching (EMT), and the use of a speech-generating device (SGD). They did so by comparing the outcomes of 34 children whose caregivers were trained on delivering this combination of interventions to outcomes of a control

group of equal size whose caregivers only received initial customization and instruction on the use of a SGD. Significant effects of intervention were noted on levels of joint attention. Standard PLS-5 expressive language scores did not show significant effects from the intervention, nor did the frequency of social communicative utterances. However, trained parents used significantly more JASPER-related strategies than those in the control group and rated high levels of satisfaction with target interventions.

Vismara et al. (2018) conducted a study to evaluate the outcomes of a parent-delivered version of the Early Start Denver Project (P-ESDM). They compared the outcomes of 14 children whose parents were trained to deliver P-ESDM interventions, to the outcomes of 10 children who received intervention training without P-ESDM materials. Both groups received a total of 12 weekly sessions lasting 90 minutes each and access to a complementary informational website. The researchers found that both groups showed treatment effects in terms of imitation, but there were no treatment effects observed for measures of initiated joint attention and spontaneous communication. The parents who received P-ESDM training accessed online resources significantly more frequently and reported higher levels of satisfaction with the intervention compared to the comparison group (NSP Consideration: Recognized parental satisfaction as a key outcome). However, there was no significant treatment effect on the parents' ability to deliver P-ESDM interventions.

Studies on educator-delivered interventions

Five studies regarding educator-delivered interventions represented a total of 217 children (M = 43.4, SD = 12.28) and 77 educator (M = 15.4, SD = 11.84) participants. Children participants in these studies ranged between two and seven years of age (M = 49.74 months, SD = 19.10), and consistent with previous literature and previously described studies of parent-

delivered interventions, 20% of student participants in these five studies were females. The study with the largest number of educator participants (n = 34) did not report educator gender. From the four studies which reported educator gender 33 of 43 educators were female.

In a pilot study Engelstad et al. (2020) examined the implementation of the Early Achievements for Education Settings (EA-ES), a naturalistic developmental behavioural intervention (NDBI) program in school settings. They analysed the outcomes of five educators and 31 students. The teachers in the intervention group (n = 15) received seven six-hour training workshops over the course of six months. After the first training, they were coached by speech-language pathologists on the use of target interventions during an average of 18 coaching sessions per teacher in the intervention group. The teachers in the control group received their usual educational training, with no additional training on the use of NDBI strategies from the research team. There were significant treatment effects detected on the frequency of initiated joint attention (NSP Consideration: Emphasis on joint attention outcomes), but no significant effects on the frequency of verbalizations or use of directed gestures. Additionally, there was a significant treatment effect on the nonverbal (visual reception and fine motor) but not the verbal (receptive and expressive language) MSEL composite scores. The educators in the intervention group had significantly higher fidelity ratings of intervention delivery compared to those in the control group at the seven post-training assessment periods.

Henry et al. (2020) assessed the outcomes of six educators and 43 children who participated in a receptive and expressive language training programme (NSP Consideration: Noted effects on language-related skills). Interventions were adaptations from those described by Solari and Ciancio (2014). Teachers of students in the intervention group participated in an initial six-hour training session which covered theoretical and practical elements of intervention

delivery. Over the following 20 weeks members of the research team delivered in-person coaching sessions in the classroom setting at a rate of once to twice times per month; during the same period teachers were trained to deliver an average of 65 sessions in a small group format (three to four students) at an average rate of four 30-minute sessions per week. Both intervention (n = 21) and control (n = 22) groups participated in the school's curriculum as usual, with sessions for the intervention group taking place as embedded components of typical school-related curriculum and activities. There were significant increases in expressive vocabulary standard scores (from the EVT-2) for the intervention and not for the control group; however, the difference between intervention and control group scores after intervention was not significant. Significant treatment effects were detected on standard scores of narrative, storytelling skills. No significant differences in scores between pre and post-intervention were detected for the control group. Teachers obtained high scores of fidelity of intervention at the beginning of intervention and moderate-high scores at the end of intervention; they also rated feasibility and acceptability of intervention as "exceptionally high".

Kaale et al. (2012) reported the outcomes of a joint attention and joint engagement program, adapted from the manual published by Kasari et al. (2016) (NSP Consideration: Observed moderate treatment effects on joint attention skills). Thirty-four preschool regular education teachers and 61 students participated in this study. Teachers received an initial six-hour training on the delivery of interventions with parent participation as optional (59% of parents attending training). Over the course of eight weeks the intervention group (n = 34) received twice-daily, 20-minute sessions delivered by teachers, with each student participating in an average of 75 (SD = 10) sessions. The sessions took place five days per week. Weekly supervision was provided by 18 specialists with degrees in special education, psychology, or

social science and an average of 11 years of experience working with students with autism. These specialists participated in an initial 3-day training on the implementation of this program. The student placement was 88% and 89% in regular education placements for the intervention and control groups, respectively. The preschool education curriculum composition did not differ significantly between the groups, with the control group only receiving their educational services as usual. The researchers found a moderate treatment effect on the frequency of the use of joint attention skills during play-based periods with teachers, but not on periods of joint engagement. Notably there was a significant treatment effect on the duration of periods of joint engagement with mothers, but not on the use of joint attention skills. There were no significant effects of treatment on scores of initiated joint attention. Teachers' fidelity of implementation was rated as fair and significantly improved over the eight-week implementation period.

Panganiban et al. (2020) studied the outcomes of 49 preschool students (mean age of 49.10 months) and their 19 special education teachers, who were trained to deliver a modified version of the JASPER intervention program. This study took place across 12 schools over the course of a school year, with seven in the intervention group and five in the control group. The teachers in the schools in the intervention group (n = 10) received an initial two-hour training, followed by an average of 28 hours distributed over two weekly sessions. The first session was held in the absence of students and was dedicated to preparing for the second session, during which the planned interventions would be delivered. Student participants from these schools (n = 29) received JASPER interventions during small-group activities that were embedded into the sequences of educational tasks traditionally included in the curriculum applied by schools in both the intervention and control groups. There was no significant treatment effect on the time spent on a joint task as both groups showed significant improvement. However, there was a

significantly higher probability of engagement in small groups by the students in the treatment group after the intervention (NSP Consideration: Highlighted changes in engagement). There was no significant effect detected on scores of spontaneous joint attention or spontaneous behaviour regulation. There was also no significant treatment effect detected on receptive and expressive language scores from the MSEL. As far as delivery of interventions, there was a significant effect of training on teachers' ability to apply JASPER strategies.

Wong et al. (2013) reported the outcomes for 13 preschool special education teachers who delivered joint attention (NSP Consideration: Observed improvements in joint attention) and symbolic play interventions to 33 students between the ages of three and six years. Over a period of eight weeks teachers delivered either a combination of interventions that started with joint attention followed by symbolic play interventions, or a combination of the same interventions in the opposite order. There was also a waitlist control group, which after the initial four-week period was assigned to either combination of interventions. There was significant improvement in joint attention for both intervention groups. However, the group that started with the joint attention intervention followed by the symbolic play intervention had significantly higher scores of joint engagement and frequency of initiated joint attention. The teachers reported a moderate-high level of acceptability, and the percentages of fidelity increased for all classrooms. Student levels of joint attention showed a significant relationship with the levels of teacher acceptability and fidelity of intervention.

Methodological analysis of the literature

A critical analysis of the methodology of these studies was applied to enhance interpretation of their findings, and further clarify how such findings are relevant to this work.

Such analysis included an examination of recruitment and sampling practices, randomisation and otherwise control procedures, and measures of outcome.

Recruitment and sampling

The sample sizes for student participants ranged between 24 and 128 students for studies on parent-delivered interventions, and between 31 and 61 students in studies of educator-delivered interventions (Mahoney & Solomon, 2016; Solomon et al., 2014; Vismara et al., 2018). Consistent with previous literature, sampling biases identified in these studies include those related to gender, age, geographical location, and cultural background. Gender representation across studies was similar with historical reports of ASD in males versus females. Recent studies have reported a 3:1 ratio of incidence of ASD between males and females (Loomes et al., 2017); student participants represented in this review were 80.65% males and 19.35% females. Only six out of the nine studies reporting parent outcomes specified whether the primary caregivers were mothers or fathers, with two studies (who analysed outcomes from the same subject group) indicating the participation of grandparents (Mahoney & Solomon, 2016; Solomon et al., 2014). Even though the remaining four studies did not specify a primary caregiver, references are made to the 'family' rather than parent, indicating that in some interventions, the training of all relevant caregivers was a fundamental premise (Vismara et al., 2018). From the six studies that reported the gender of the primary caregiver, an average of 87.68% of the parents were mothers (Solomon et al., 2014; Mahoney et al., 2016; Vismara et al., 2018). The lowest participation ratings by fathers were between 8.3% and 8.6% of 128 and 112 parent participants in the Solomon et al. (2014) and Mahoney et al. (2016) studies, respectively. This was expected as both used data from the same cohort. The highest rating of participation by fathers was recorded by Vismara et al. (2018) with 5 fathers out of a total of 24 parents (20.83%). As far as geographical and cultural

diversity, 12 from the 14 studies in this review took place in the United States, except for one study on parent-delivered interventions who took place in India (Manohar et al., 2019), and one on educator-delivered interventions which took place in Norway (Kaale et al., 2012).

Seven out of the ten studies reported ethnographic participant characteristics under varying classification systems (Hampton et al., 2020; Lindgren et al., 2020). These ranged from 10% of minority representation reported by Lindgren et al. (2020) to 48% and 64% of 'white, non-Hispanic' children who participated in the control and intervention groups, respectively, from the Hampton et al. (2020) study. Two studies made explicit references to cultural considerations in the design or delivery of interventions (Manohar et al., 2019; Hampton et al., 2020). The underrepresentation of females diagnosed with ASD, fathers as providers of intervention, and families from diverse cultural backgrounds has significant implications for the generalisation of the results from this review of literature to the experiences of increasingly diverse groups.

Randomisation

In 13 of the 14 studies selected for review, randomisation was carried out through explicit allocation concealment strategies including assignment by a computer programme or independent data coordination centres, blocked and stratified randomisation, group minimisation, and the use of opaque sealed envelopes. Only one study (Wong, 2013) did not describe randomisation in any more detail than using a random numbers list. From the studies on parent-delivered interventions only the studies by Lindgren et al (2020) and Manohar (2019) explicitly refer to and explain not blinding parents to group assignment. From the studies on educator-delivered interventions, only Kaale et al. (2012) and Engelstad et al. (2020) reported blinding educator participants, and only Kaale et al. (2012) makes explicit mention of blinding parents of

children participants. Characteristics of participants from intervention and control groups in all studies were comparable, with adjustments reported during statistical analysis (e.g., via linear regression or Bonferroni correction) for studies where children participants differed in characteristics influential to outcomes measured.

Outcome measurement

Children/student outcomes reported in these studies were representative of areas of impairment in ASD according to its definition per the DSM-V outlined earlier in this chapter. This definition includes: (1) the presence of a social communication impairment; and (2) the manifestation of restrictive and repetitive behaviours. For both types of studies—those concerning parent-delivered and educator-delivered interventions—outcomes related to measures of proximal language areas—developmental abilities precursor to verbal behaviour and complex language skills—and distal measures, which include higher order language skills and measures of ASD severity.

Based on the analysis of measures and outcomes reported by each study, (Figure 7) studies on both parent and educator-delivered interventions targeted proximal and higher-order language skills, while only studies on parent-delivered interventions reported scores of ASD severity as outcome measures.

Figure 7. Categories of outcomes for children/student participants from studies in review.

```
┌─────────────────────┐        ┌─────────────────────┐
│   Parent-delivered  │        │  Educator-delivered │
│    interventions    │        │    interventions    │
└─────────────────────┘        └─────────────────────┘

          ┌──────────────────────┐
          │   Proximal/pivotal/  │
          │    preverbal skills  │
          └──────────────────────┘

          ┌──────────────────────┐
          │     Higher-order     │
          │    language skills   │
          └──────────────────────┘

          ┌──────────────────────┐
          │     Scores of ASD    │
          │    symptom severity  │
          └──────────────────────┘

┌──────────────────┐      ┌──────────────────┐
│      Social      │      │  Restrictive and │
│   Communication  │      │     Repetitive   │
│     Deficits     │      │    Patterns of   │
└──────────────────┘      │    Behaviours,   │
                          │    interests, or │
                          │     activities   │
                          └──────────────────┘
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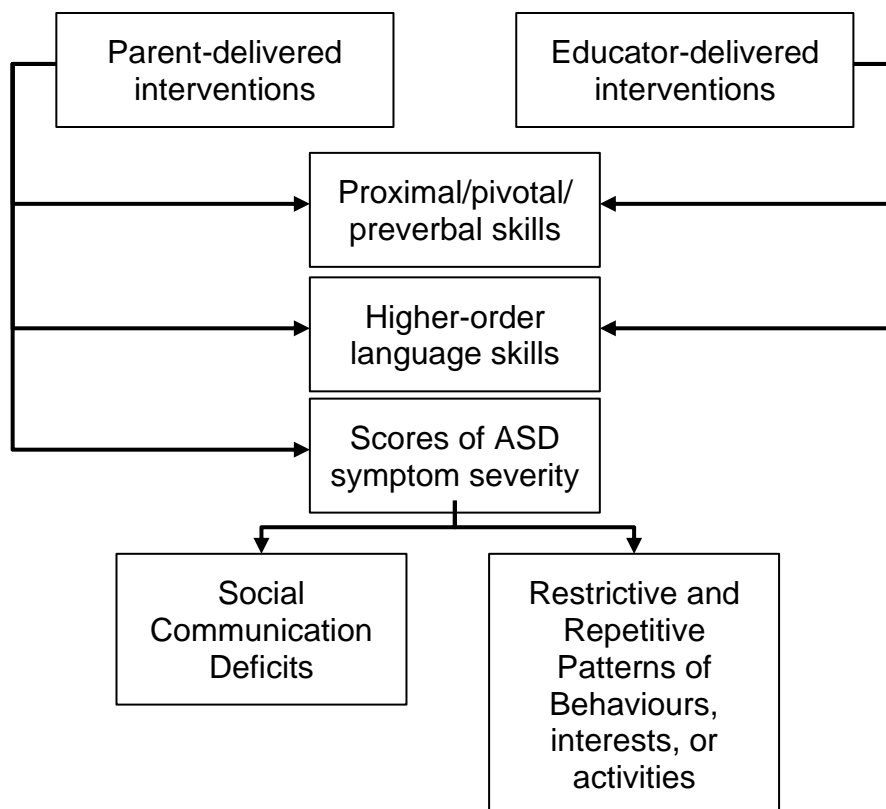
While outcomes for educators were more closely related to delivery of interventions, parent outcomes were also more closely aligned to personal factors such as use of coping strategies, level of parental stress and depression, as well as perception of a working alliance with relevant professionals (Figure 8). Measures of acceptability and fidelity of implementation of interventions were reported by studies on parent and educator-delivered interventions.

Figure 8. Categories of outcomes for parent and educator participants from studies in this review.

```
┌─────────────────────┐              ┌─────────────────────┐
│   Parent outcomes   │              │      Educator       │
│                     │              │      outcomes       │
└─────────────────────┘              └─────────────────────┘


┌─────────────────────┐              ┌─────────────────────┐
│   Parent coping     │              │   Acceptability of  │
│       Skills        │              │    Interventions    │
└─────────────────────┘              └─────────────────────┘
┌─────────────────────┐              ┌─────────────────────┐
│   Parental stress   │              │     Fidelity of     │
└─────────────────────┘              │   implementation    │
┌─────────────────────┐              └─────────────────────┘
│      Parental       │
│     depression      │
└─────────────────────┘
┌─────────────────────┐
│   Perception of a   │
│  working alliance   │
│  with professionals │
└─────────────────────┘
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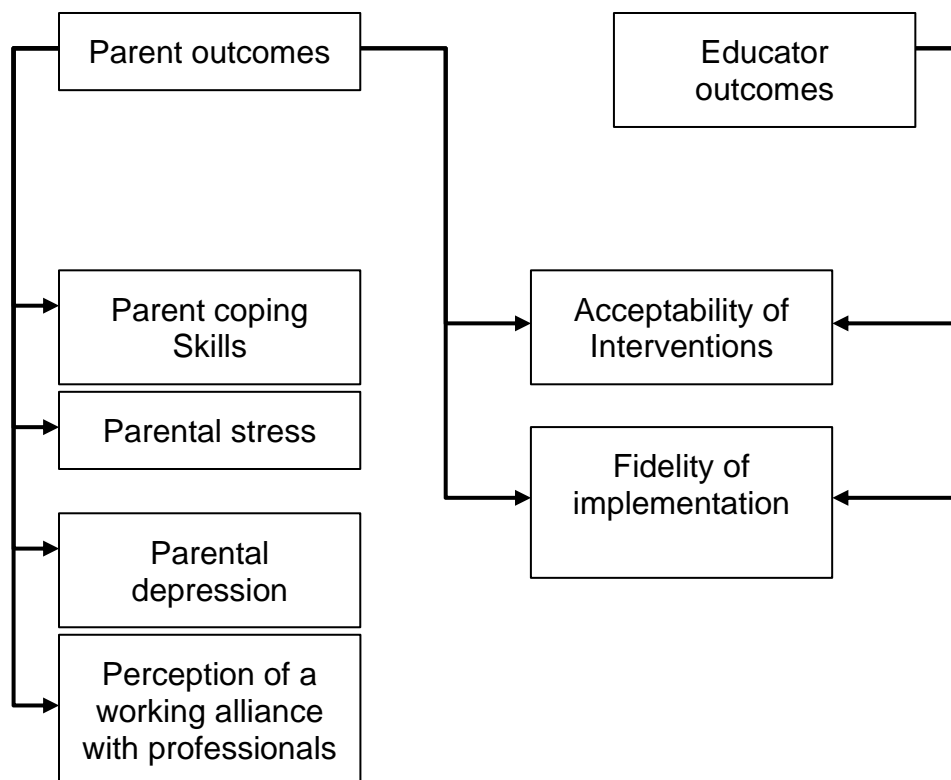
From the studies on parent-delivered interventions, the study by Manohar et al. (2019) was the only which did not use blind assessors of outcome measures. All the studies on educator-delivered interventions blinded raters for outcome measures, and two studies blinded educator participants up to the point of allocation (Engelstad et al., 2020; Kaale et al., 2012). Measurement of higher-order language skills by studies on parent-delivered interventions were used twice as much as measurement of proximal language skills. The opposite was noted for studies on educator-delivered interventions, where measurements of proximal language skills were obtained significantly more often than those related to higher-order language skills. Additionally, only studies on parent-delivered interventions reported severity of ASD symptoms as measures of outcome, and only the study by Vismara et al. (2018) on parent-delivered ESDM interventions reported measures of engagement with training materials by parent participants.

Follow-up

From the nine studies on parent-delivered interventions, three reported maintenance of outcomes via analysis of data collected weeks or months after the intervention period. There was no follow-up or otherwise maintenance data for any of the studies on educator-delivered interventions.

Ethical considerations and conflicts of interest

Three studies reported potential financial conflicts of interest among their authors (Hampton et al., 2020; Hardan et al., 2015; Rogers et al., 2012). From the seven studies in which authors declare no conflicts of interest, only two of the four that evaluated intervention models with intellectual property belonging to the main authors declared potential financial conflicts of interest (Lindgren et al., 2020; Vismara et al., 2018). Solomon et al. (2014) declared no financial conflicts of interest but stated that they had received payment as part of the original grant that funded the study. Only the authors of two studies did not include a statement of conflict of interest (Mahoney & Solomon, 2016; Manohar et al., 2019).

Synthesis of literature

Research question 1 - What evidence-based ABA, play and speech-language interventions and intervention models were parents and educators trained to deliver in home and school settings?

Child-led, play-based interventions were most frequent across studies of both parent and educator-delivered interventions (Tables 2 and 3). It was only three from a total of nine studies on parent-delivered interventions which use ABA-based interventions including PRT, FCT, and ABA-based interventions embedded within an NDBI delivery format (Hardan et al., 2015, Lindgren et al., 2020, and Manohar et al., 2019, respectively). However, it is noteworthy that as

far as play-based interventions, the study by Hampton et al. (2020) on the use of JASPER also included DTT and EMT, and the study by Lindgren et al. (2020) on the use of FCT—a specific ABA-based technology—also included periods of child-led, play-based interaction. Only the study by Henry and Solari (2020) focused on implementation of adult-directed interventions aimed at teaching specific expressive-receptive language skills.

In addition to the variability of duration and intensity of interventions across studies in this review, there are important potential confounders to consider to adequately assess their pattern of delivery. For seven of the studies, implementation of interventions ranged from 12 weeks to three months, three studies delivered interventions from periods between four and six months, and four studies delivered interventions for a one-year period. In most studies intensity of Intervention was measured by measures of parental reports and calculated in weekly hours of intervention, ranging from two to 12 weekly intervention hours.

Research question 2 - What were the outcomes for children involved in these studies?

Changes in ASD severity scores

Five studies—all on parent-delivered interventions—reported composite scores of ASD severity from standardised assessment as outcomes; measures included the CARS, CGI, ADOS, and ADOS-T. From these, four studies focused on interventions which took place primarily in a child-led format. The exception was a study (Hardan et al., 2015) which reported positive outcomes after a relatively short period of time (three months); However, these changes were only reflected on the social communication subscale of the CGI. Manohar et al. (2019) reported a small but statistically significant improvement in scores from the CARS, but changes in scores were only identified in five of the 15 categories assessed through the CARS. As described, Hardan et al. (2015) reported positive changes in CGI-Improvement ratings from the Clinical

Global Impression Scale, but it is important to note that the CGI is a measure of improvement in a condition due to treatment and not exclusively the severity of ASD symptomatology. Solomon et al. (2014) reported that children whose parents received PLAY intervention training were twice as likely to be assigned to a lower severity category on the ADOS-G, but there were no significant changes in ADOS-G total scores. It is also worth noting that these studies did not report on maintenance or follow-up measures, and there were significant methodological limitations such as the absence of blinding procedures for researchers and parent participants. These results, along with the limitations of these studies, should be considered when analysing the ASD severity scores in the context of chapters eight and nine.

Changes in measures of social communication skills

Findings from this review highlight relationships between intervention settings, models of intervention, length of implementation, and types of outcome measurement related to the development of proximal and higher-order language skills. Most studies with a prominent focus on ABA-based interventions (Hardan et al., 2015; Henry & Solari, 2020; Lindgren et al., 2020) were the only ones to report significant effects from intervention after periods of less than six months, with the study by Hampton et al. (2020) being the exception. It is important to note that none of these studies reported measures of proximal language skills, and that the study by Shire et al. (2016) did not report measures of distal language skills. Additionally, even though Hampton et al. (2020) assessed the implementation of DTT, they did so in combination with play-based interventions and the use of a speech-generating device. As far as parent-delivered, child-led interventions, only those administered for a one-year period showed significant effects on distal language measures (Mahoney & Solomon, 2016; Manohar et al., 2019; Solomon et al., 2014), in contrast to studies on child-led interventions with implementation periods of four

months or less (Hampton et al., 2020; Rogers et al., 2012; Vismara et al., 2018). Educator-delivered, play-based interventions displayed a different trend towards measures of proximal language skills, showing significant effects in seven out of 17 collective measures. The study by Panganiban et al. (2020), which did not report significant effects of treatment on distal or proximal language skills after a one-year implementation period, was the exception to both above-described trends in outcome measurement.

3. What were the outcomes for parents and educators involved in these studies?

Findings from parent and educator outcomes in this review included general acceptability of interventions and high ratings of implementation fidelity by parents and educator participants by most studies. Effects were also reported on personal factors including parental stress, depression, use of coping skills, responsive style of behaviour, and engagement with training materials; however, these were reported by a limited number of studies and some with mixed results.

Acceptability and delivery of interventions

A total of six studies have reported on the acceptability of interventions by parents and educators, all with positive results (Hardan et al., 2015; Henry & Solari, 2020; Lindgren et al., 2020; Manohar et al., 2019; Vismara et al., 2018; Wong, 2013). Hardan et al. (2015) and Manohar et al. (2019) found high acceptability because of adequate levels of implementation by parents, but without independent qualitative or quantitative measures of treatment acceptability. Regarding the relationship between acceptability and measures of implementation fidelity, Wong et al. (2013), who found high levels of acceptability but no significant effect of the intervention on the fidelity of implementation by educators. However, Wong et al. (2013) found that educators in both the experimental and control groups reached satisfactory levels of

implementation adherence. Of the ten studies that reported measures of fidelity or adherence of implementation, only Rogers et al. (2012) and Wong et al. (2013) reported no significant differences in implementation fidelity between the intervention and control groups of parent and educator participants, respectively. However, both studies did report significant increases in fidelity for both the intervention and control groups of trainees. Additionally, Shire et al. (2016) and Mahoney et al. (2016) simultaneously measured fidelity of implementation and a responsive style by parents, as adequate responsive behaviours by parents towards their children is a central component of target interventions.

Parent-related factors

Two studies have reported on levels of parental stress with mixed results. While Manohar et al. (2019) reported significant effects of the intervention on levels of parental stress and the use of coping skills, Solomon et al. (2014) did not report significant positive effects on levels of parental stress. However, Solomon et al. (2014) did report some improvement in levels of depression when analysed categorically, with parents in the intervention group being significantly less likely to be classified as 'depressed' based on the cut-off score from the CES-D (Appendix A). Two of the studies reported outcomes related to parents' style of interaction. As previously described, Mahoney et al. (2016) reported a significant effect of the parent's responsive/affective behaviour on the delivery of the PLAY intervention on child outcomes. Additionally, Shire et al. (2016) reported significant positive effects of the intervention on parents' responsive behaviour after JASPER training. Finally, only Vismara et al. (2018) reported on parents' engagement with training materials, with trained parents showing significantly higher measures of engagement with an informational website, significantly more frequent contact with

the assigned therapist via email and being more likely to record implemented interventions than parents in the community intervention group.

Discussion

The research undertaken in this literature review closely aligns with several key benchmarks outlined in the National Standards Project (NSP). It underscores the significance of interventions aimed at addressing fundamental challenges in autism spectrum disorder (ASD), such as social communication, behaviour, and language development. While numerous studies showcased positive treatment effects in these areas, certain NSP criteria remained inconsistently addressed in the reviewed literature. Elements like the generalisation of skills across settings, the maintenance of treatment gains over time, and the long-term impact of interventions received limited exploration. This discrepancy highlights the need for further research to comprehensively address all NSP-recommended domains and standards for effective interventions in ASD.

Comparatively, there is a relatively smaller body of research focusing on parent and educator-delivered interventions for school-age children when juxtaposed against studies conducted by specialists or in clinical settings. This review aimed to explore interventions taught to parents and educators in highly controlled studies for implementation in home and school settings, framing these interventions and outcomes within the existing body of evidence.

Consistent with research comparing clinical versus home- and school-based interventions, this review predominantly discovered studies on naturalistic interventions. Notably, ABA-based interventions explicitly implemented in the home setting often encompassed NDBIs. For instance, Manohar et al. (2019), Lindgren et al. (2020), and Hardan et al. (2015) incorporated ABA-based interventions complemented by NDBIs, suggesting a strategic choice possibly due to practical concerns.

Additionally, the operational descriptions of interventions and outcomes in these studies, as is often the case in clinical research, were consistent with the philosophical frameworks that support them. However, there are significant areas of overlap regarding their practical implementation, which may have implications for how these implementations are approached during parent and educator training practices.

There were both positive and negative child/student-related outcomes detected by distal outcome measures such as ASD severity and social communication skills, as well as by measures of proximal and high-order language skills. Even though there was considerable variety between the measures of outcomes employed across studies, there were evident trends in their selection between parent and educator-delivered intervention studies. Severity scores of ASD were only reported as an outcome measure in five of the studies on parent-delivered interventions. Additional limitations to the interpretation and generalisation of these results are the variability of these measures across these five studies. One of these measures, the CGI used by Hardan et al. (2015), is an instrument designed to rate the severity of impairment in general. Additionally, even though the mean age was comparable across child/student participants in parent and educator-delivered interventions, studies on parent-delivered interventions measured the use of higher-order language skills (e.g., frequency of verbal behaviour use) significantly more often than proximal language skills (e.g., frequency of initiated joint attention) as child-related outcomes.

Much like child/student-related outcomes, the positive outcomes related to parents and educators outnumbered the negative ones, however with significant limitations. This was also true for outcomes of fidelity implementation, acceptability, and less frequently measured

outcomes such as alliance with professionals and engagement with training materials. As previously described, exceptions included two studies that did not find a significant effect of the target intervention on implementation fidelity, but still evidenced significant improvement for parents and educators in both the intervention and control groups (Wong et al., 2013; Rogers et al., 2012). Another notable result was that of two interventions applied for a one-year period. The study by Manohar et al. (2019) found adequate application of NDBI and ABA-based interventions by parents, as well as positive intervention effects on levels of parental stress and the use of coping strategies. These results were in contrast with the reports by Solomon et al. (2014), who found no effect of the interventions on continuous scores of parental stress and depression, but were followed by a study on outcome data from the same population (Mahoney et al., 2016) which found adequate levels of parents' application of PLAY interventions focused on parents' responsive behaviour.

Limitations of this review

Limitations to consider while interpreting these results and their implications include the scope of this review of research, as well as the methodological limitations of the identified studies. The scope of studies identified in this review was limited by the search for specific types of interventions (ABA, play-based interventions, speech and language-based interventions); this certainly discounted studies on interventions delivered by professionals in related allied-health or education disciplines or from differential theoretical frameworks such as sensory-processing based interventions often delivered by occupational therapists (Schaaf et al., 2012). The scope of interventions was also limited by the relatively smaller body of RCTs published on home- or school-based interventions in general, further limited by the discounted studies which did not report student outcomes. This was the case for studies such as Fisher et al. (2014), Bagaiolo et al.

(2017), and Jang et al. (2012) on parent-delivered ABA interventions, which were excluded from the review as they involved only theoretical training with no reported outcomes outside of the participants' theoretical knowledge of the training material.

Methodological limitations from the studies in this review to consider include sample sizes, which were medium on average and therefore can have a significant impact on the reliability and generalisability of the results. As previously described, the variety of outcome measures analysed in these studies is consistent with some characteristics of ASD that often contribute to areas of impairment in school-age children. However, such variety is still limited to specific broad and narrow constructs such as standardised severity scores, expressive or receptive language scores, or periods of joint attention and engagement. The repertoire of identified interventions was therefore defined and limited by variables including participant characteristics, some of this an expected result of exploring outcomes from a specific population, and the settings where the interventions were applied. Furthermore, only three studies—none on educator-delivered interventions—reported data from follow-up measures collected weeks or months after the interventions were delivered. Finally, there was inconsistent reporting of conflicts of interest across these studies, with only some disclosing potential financial COIs as authors of the target intervention.

Clinical implications

The findings of this review have several implications for clinical practice, including the need and support for parent and educator-delivered interventions, the selection of interventions, the mechanisms for consistently and effectively delivering interventions, and the assessment of relevant outcomes for school-age children with ASD.

Professionals who provide evidence-based interventions for school-age children with ASD may need to prioritise parent and educator training for the delivery of interventions in home and school settings. The applicability and acceptability of interventions by parents and educators in these studies demonstrate the feasibility and necessity of their training to deliver interventions in home and school settings. Most of the studies included in this review reported adequate delivery of interventions by parents and educators, and all studies that reported acceptability or satisfaction with interventions had positive results. This aligns with research showing that parents and educators have positive attitudes towards being trained to deliver interventions and that they can demonstrate high levels of implementation fidelity (Patterson & Smith, 2011; Rieth et al., 2018). Additionally, the intensive and individualised nature of effective intervention programs for school-age children with ASD, which often require specialised intervention throughout most of the child's waking hours (Patterson & Smith, 2011), support the need for parent and educator training.

The selection and design of relevant interventions for school-age children with ASD should be individualised and systematic (Couper, 2004; Crosland & Dunlap, 2012). Interventions should be based on relevant evidence; they should also be inclusive of the individual child's familial, cultural, and otherwise context (Leaf et al., 2022). Philosophical inclinations and biases, some with a historical basis, can influence the perception of ABA-based interventions, which are often reduced to a single ABA technology such as Discrete-Trial Teaching (DTT). This overlooks the many other related technologies that are often part of comprehensive ABA-based intervention programs. Additionally, the stigma surrounding the use of aversive stimuli in early ABA-based intervention studies has led some parents and interventionists to view all 'behavioural' interventions through a negative lens. It is argued that much of the negative stigma

carried at times by the term 'ABA' may be based on the ABA technologies available in earlier

decades and how these were applied (Kirkham, 2017). Additionally, there are issues around the

individual experiences with ABA intervention, which at times may not have had the adequate

guidance and therefore engage significant misconceptions (Morris, 2009). ABA programmes

should be compositions of interventions aimed at teaching socially important behaviours. Baer,

Wolf & Risley included in their article *Some current dimensions of applied behaviour analysis*

(Baer et al., 1968):

> *"In application, the theoretical importance of a variable is usually not at issue. Its*
>
> *practical importance, specifically its power in altering behaviour enough to be*
>
> *socially important, is the essential criterion" (p. 96).*

Relevant to the misconceptions of ABA as a structured intervention which strictly produce

behaviours programmed under very controlled conditions, Baer, Wolf & Risley describe the

importance of a generalisation paradigm, which has implications on how the environment around

the individual facilitates application of acquired skills during intervention to relevant everyday

contexts:

> *"In general, generalization should be programmed, rather than expected or*
>
> *lamented" (97).*

By acknowledging areas of overlap between 'types' of interventions, despite their

philosophical differences, parents and interventionists can seek and utilise not just 'packages' of

interventions, but individually tailored combinations of relevant interventions. This, in turn, has

implications on how professionals and other interventionists train parents and educators to

themselves deliver interventions, as a thorough understanding and explanation of different types

of interventions can increase the nuanced understanding of similarities and differences between

strategies and models, leading to a greater willingness to implement evidence-based interventions beyond superficially preferred choices.

The findings from this literature review notably align with several key criteria outlined in the National Standards Project (NSP), emphasizing interventions that target core ASD-related challenges like social communication, behaviour, and language development. However, while many studies demonstrated positive treatment effects in these areas, there were certain NSP criteria not consistently addressed in the reviewed literature. Specifically, aspects related to generalization of skills across settings, maintenance of treatment gains over time, and the long-term impact of interventions were not extensively reported. Additionally, the review highlighted variations in the assessment of specific NSP standards, indicating a need for further research to comprehensively address all NSP-recommended domains and standards for effective interventions in ASD.

Research implications

Additional research on parent and educator-delivered evidence-based interventions may be part of the solution for long standing issues regarding the comprehensive and team-based design and delivery of ASD-based intervention programmes. A significant obstacle in adequate delivery of interventions is the pervasive need by many school-age children with ASD for intensive, constantly adapting individualised interventions well into the primary school age, sometimes even after periods of intensive intervention during the early years (Ganz, M. L., 2007). This obstacle is compounded by little or no access to qualified professionals in many parts of the world (Mcgee & Morrier, 2005; Wise et al., 2010), as well as by the fact that school-age children diagnosed with ASD spend most of their waking hours at home and school (Ganz, M. L., 2007). Regardless of application of specific interventions or intervention models, most

authors in this review explicitly described intervention design and delivery in consideration of the individual needs of children/students (e.g., Manohar et al., 2019; Solomon et al., 2014).

In addition to the relative number of controlled studies on parent and educator-delivered interventions, the limited amount of evidence is also noted in the selection of interventions and therefore the assessed outcomes. Interventions and outcomes in these studies may have been selected in part due to the need to target critical developmental areas in children/student participants. However, there may have also been practical considerations stemming from the nature of research, as it would be impractical to conduct reliably controlled research to evaluate the effects of multiple interventions on all areas of impairment. This suggests that the still evolving body of ASD intervention research may result from the eventual collection of a long-term body of research conformed by many studies, assessing different interventions in multiple conditions in measurement of all relevant outcomes.

Conclusions

This review aimed to identify the interventions applied and outcomes reported by highly controlled studies focused on parent and educator-delivered interventions in recent years. In addition to gaining a better understanding of the evidence behind factors crucial to the successful delivery of ASD-related interventions, its purpose was to provide a frame of reference from which to derive clinical and research-based implications in this work. More highly controlled research across diverse geographical locations is needed to better understand how to comprehensively build effective and efficient intervention programs for school-age children with ASD across populations. Despite the limitations of this review and the results from these studies, it is evident that parents and educators can be trained to deliver child and adult-led interventions with effects on proximal language skills such as joint attention and engagement, as well as

higher-order skills such as recalling narratives and using verbal requests. The feasibility of conducting controlled studies with parent and educator trainees should encourage the clinical and research community to participate in research to accelerate our understanding of a multidimensional and comprehensive approach to ASD intervention.

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CHAPTER 4

Study I

Mixed Parent and Educator Training Sessions

During two theoretical training phases of the *SEC-ETP Project* parents and educators of students diagnosed with autism spectrum disorder (ASD) in the public school system in the northern Mexican State of Sonora received training for the collaborative design and subsequent implementation—subject of chapters eight and nine—of ASD-related, evidence-based interventions (EBIs) in home and school settings. The current study analyses parent and educator outcome data extracted after it was routinely collected from two mixed parent and educator training groups through the course of two different *theoretical training* phases of the SEC-ETP Project. Parent and educator outcomes included scores from Likert-type questionnaires completed before and after theoretical training sessions.

Study Aims

This study aims to assess and better understand parent and educator factors and outcomes relevant to training for delivery of ASD-related EBIs in home and school environments. Outcomes include perceptions of their instructional efficacy, as well as their perceptions of the supports provided by SEC for adequate intervention delivery. This study also evaluates differences in outcomes between two mixed parent and educator cohorts; while the first training cohort was trained in an in-person format, the second was trained in a live virtual training format. Table (2) includes the research questions which addressed each of these factors, as well as the data collected and means for its analysis.

Table 2. Study I research questions, data collected and tools for its analysis.

Research question	Data	Tool for analysis and sensitivity
Parent and educator self-perceptions of instructional efficacy		
1. Were there statistically significant changes in average scores of parent and educator perceptions of their instructional efficacy from pre to post-training conditions?	Scores of parent perceptions of their own instructional efficacy collected before and after training for the in-person training group	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.34), (power = 0.8, α = .2, n = 38)
	Scores of parent perceptions of their own instructional efficacy collected before and after training for the videoconference-format training group	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.48), (power = 0.8, α = .2, n = 20)
	Scores of educator perceptions of their own instructional efficacy collected before and after training for the in-person training group.	Paired-samples two-tailed t-test, Sensitivity to small effect (0.16), (power = 0.8, α = .2, n = 164)
	Scores of educator perceptions of their own instructional efficacy collected before and after training for the videoconference-format training group.	Paired-samples two-tailed t-test, Sensitivity to small effect (0.19), (power = 0.8, α = .2, n = 130)

2. Were there statistically significant changes in average scores of parent perceptions of educator instructional efficacy from pre to post-training conditions?	Scores of parent perceptions of educator instructional efficacy collected before and after training for the in-person training group	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.34), (power = 0.8, α = .2, n = 38)
	Scores of parent perceptions of educator instructional efficacy collected before and after training for the videoconference-format training group.	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.48), (power = 0.8, α = .2, n = 20)
Parent and educator perceptions of the supports provided by SEC for the delivery of interventions		
3. Were there statistically significant changes in parent and educator scores of perception of institutional knowledge and culture by SEC in order to effectively administer interventions for students with ASD?	Scores of parent perceptions of supports provided by SEC for delivery of interventions for the in-person training group	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.34), (power = 0.8, α = .2, n = 38)
	Scores of parent perceptions of supports provided by SEC for delivery of interventions for the videoconference-format training group.	Paired-samples two-tailed t-test, Sensitivity to medium effect (0.48), (power = 0.8, α = .2, n = 20)
	Scores of educator perceptions of supports provided by SEC for delivery of interventions for the in-person training group	Paired-samples two-tailed t-test, Sensitivity to small effect (0.16), (power = 0.8, α = .2, n = 164)

	Scores of educator perceptions of supports provided by SEC for delivery of interventions for the videoconference-format training group.	Paired-samples two-tailed t-test, Sensitivity to small effect (0.19), (power = 0.8, α = .2, n = 130)
Differences between in-person and videoconference-format groups		
4. Were there statistically significant differences between questionnaire scores by in-person and teleconference training cohorts?	Scores of parent perceptions of instructional efficacy for in-person and videoconference-format training groups.	Two-tailed t-test, Sensitivity to large effect (0.59), (power = 0.8, α = .2, n1 = 38, n2 =20)
	Scores of educator perceptions of instructional efficacy for in-person and videoconference-format training groups.	Two-tailed t-test, Sensitivity to medium effect (0.24), (power = 0.8, α = .2, n1 = 164, n2 =130)

Method

Design

The current is a quantitative, non-experimental, exploratory study which analyses routinely collected outcome data from two mixed parent and educator training groups through the course of two different *theoretical training* phases of the SEC-ETP Project. A within-group design was used to compare scores from parents and educators before and after training, and a between-groups model was used to compare scores between in-person and videoconference-format groups.

Ethical Approval

Informed Consent for participation in this study was provided by parent (Appendix L) and educator (Appendix M) participants before the beginning of theoretical training sessions. Ethical approval for these studies was granted by the Salomon's Centre for Applied Psychology Board of Ethics (Application ETH1920-0116).

Sample

A total of 173 parents and 470 educators participated in two different training phases of the SEC-ETP Project. The first cohort completed training from October to December of 2019, and the second from November to December of 2020. The first cohort was composed of 79 parents and 196 educators who participated in in-person training while the second included 94 parents and 274 educators who received training in a videoconference format. However not all participants attended all training units; this meant not all parent and educators participants completed questionnaires before and after training was completed. A total of 38 parent participants from the in-person and 20 parent participants from the teleconference cohort

completed both questionnaires, as did 164 educators from the in-person and 130 educators from the teleconference-format training cohort.

Outcome measures

The in-person group completed consent forms and questionnaires via printed forms and questionnaires (Appendices M and N). Per routine SEC-ETP Project data collection protocols, answers to questionnaires were subsequently transcribed into Excel spreadsheets and stored in a secure digital location by the ETP Project implementation team. The teleconference training group provided consent and completed questionnaires via the secure website www.proyectosecetp.mx. Appendix C is the questionnaire completed by parent participants who completed it in person, while appendix D is the questionnaire completed by educator participants.

Parent and educator perceptions of Instructional self-efficacy

Measures of perceptions of instructional self-efficacy included responses to questions two, five, six, 16, 17 and 18 from the parent self-efficacy questionnaire (Appendix C), and questions one, two, three, four, five, eight, nine, and then from the educator self-efficacy questionnaire (Appendix D). Additionally, measures of perceptions by parents about educators' instructional efficacy were measured by responses to questions three, eight, 10, 11 and 15 from the parent quality control questionnaire.

Parent and educator perceptions of provision of adequate educational supports provided by SEC for the education of students with ASD

Parent and educator perceptions of the adequacy of support offered by SEC for implementation of effective intervention plans was measured via responses to questions one,

four, seven, nine, 12, 13 and 14 from the parent quality control questionnaire and questions six

and seven from the educator quality control questionnaire.

Differences between in-person and teleconference training group scores

Responses to all questions from the same questionnaires were used to draw

comparisons between in-person and teleconference training parent and educator groups.

Data extraction and analysis

Data from participants who provided informed consent was extracted by the main author

from databases from the Project. Statistical analysis of data was used to evaluate significance of

differences between scores via two-tailed t-tests (Table 2). SPSS software version 29.0 was used

to run statistical analyses.

Within-group score comparisons

Changes in average test scores from questions regarding instructional efficacy between

administrations of the questionnaire pre and post-training by each cohort were compared via

two-tailed t-tests (Table 2). Analysis prior to data extraction suggested sensitivity to a medium

effect (0.34) for two-tailed tests (power = 0.8, α = .2, n = 38) between parent scores and to a

small effect (0.19) for two-tailed tests (power = 0.8, α = .2, n = 130) between educator scores in

the in-person training cohort. It also yielded sensitivity to a medium effect (0.48) for two-tailed t-

tests (power = 0.8, α = .2, n = 20) between parent scores and to a small effect (0.19) for two-

tailed t-tests (power = 0.8, α = .2, n = 130) between educator scores in the videoconference-

format group.

Between-group score comparisons

Differences between average test scores from in-person and videoconference-format

training groups were compared for all items in the quality control questionnaire within areas of

interest. Two-tailed t-tests were used to assess the significance of the difference between average scores. Analysis prior to data extraction suggested sensitivity to a medium effect (0.59) for two-tailed tests (power = 0.8, α = .2, n1 = 38, , n2 = 20) for comparison of scores between parent cohorts and sensitivity to a medium effect (0.24) for a two-tailed t-test between scores by educator in-person and videoconference-format cohorts (power = 0.8, α = .2, n1 = 164, , n2 = 130) .

Findings

There were important findings related to parent and educator perceptions of instructional self-efficacy and of support received and a working alliance with SEC in regard to delivery of educational ASD-related services. Additional notable findings include differences between training cohorts in their reported understanding of specific therapeutic interventions—play-based concepts—, as well as notable results from comparison between scores from in-person and teleconference training cohorts.

1. Were there statistically significant changes in average scores of parent and educator perceptions of their ability to deliver specific interventions from pre- to post-training conditions?

There were significant increases in scores of instructional self-efficacy (Figure 9) reported by parents and educators across in-person and telehealth training cohorts after training. Tables 5 and 6 include the results from statistical comparisons between pre and post-training scores for parents and educators, respectively. Statistically significant increases in cumulative scores of parent instructional self-efficacy were detected in both in-person and teleconference training cohorts (questions 2, 5, 6, 16, 17, and 18). Significant increases were detected for scores from all individual items for both cohorts, with the exception of item 17—concerning the

understanding of specific play-based concepts such as *circles of interaction* and *interactive play*—by the in-person parent training cohort which did not evidence significant change between pre- and post-training conditions. As far as educators, there was a statistically significant increase in cumulative scores of instructional self-efficacy by both in-person and teleconference training cohorts (questions 1, 2, 3, 4, 5, 8, 9, and 10), with significant increases detected between scores for all questions for both cohorts.

Figure 9. Comparison of self-reported instructional efficacy average scores between pre- and post-training for both cohorts of parents and educators.
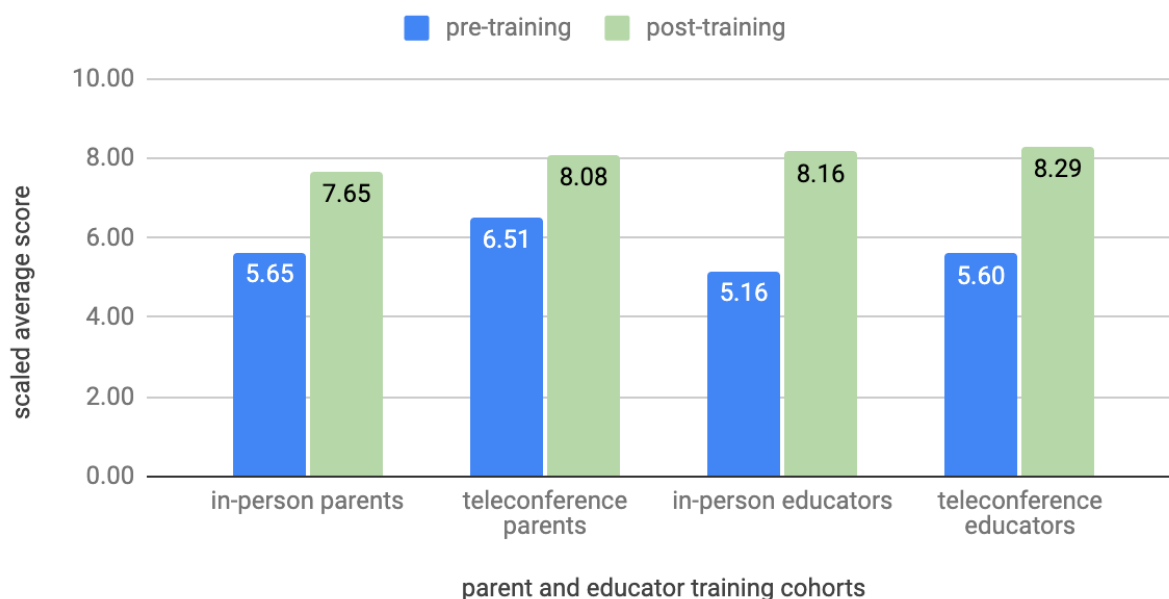
The only item for which educators' scores did not evidence significant change was for rating of behavioural problems seen in students with ASD (Item 11), in neither in-person nor teleconference training cohorts from pre to post-training phases.

2. Were there statistically significant changes in parent and educator scores of perception of supports offered by SEC for delivery of interventions for students with ASD?

Scores on parent perspectives on the work by and with SEC—including their perception of educational support offered and of their working alliance (Figures 10, 11—did not evidence statistically significant change after training (Appendix E). However, there was significant improvement in average scores for item seven ("Communication with my child's school and educators is effective.") and eight ("My child is an accepted and included member of his school community.") by the in-person training parent cohort, increases not reflected by teleconference-trained parent scores for the same item (Appendix E). As far as educator perceptions of support provided by SEC for delivery of interventions (questions 6 and 7), there was a significant increase detected from in-person and teleconference educator cohort scores after training (Appendix F).

Figure 10. Comparison of scores of perceptions of supports offered by SEC between pre- and post-training for both cohorts of parents and educators.

Scaled average scores of perceptions of supports provided by SEC before and after theoretical training
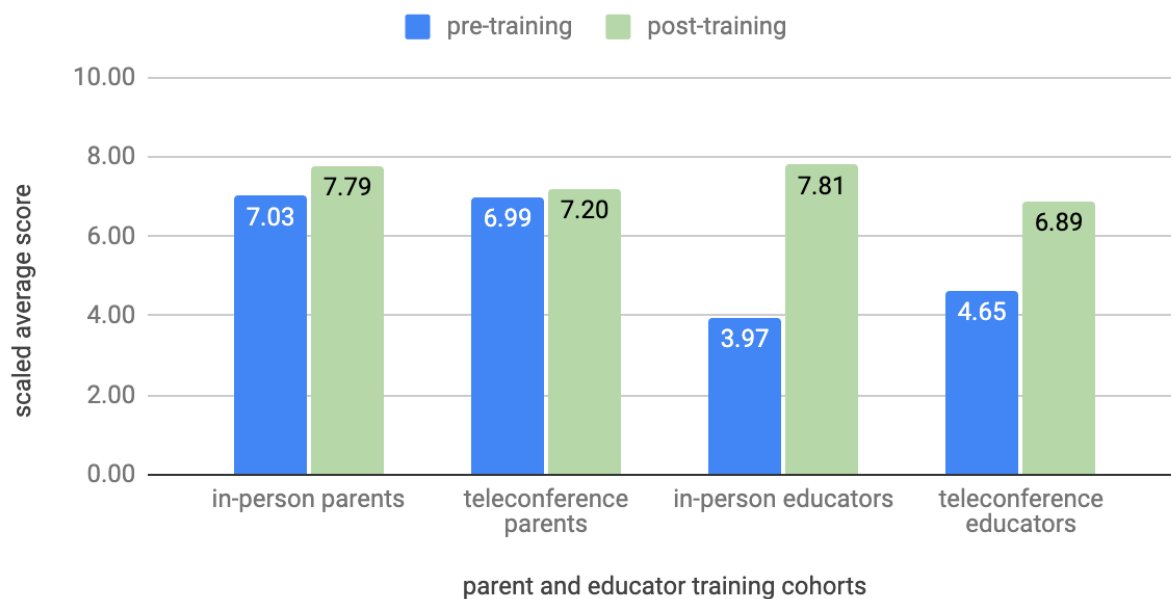
There were non-significant increases in cumulative scores for items related to parent perception of their working alliance with SEC (questions 1, 4, 7, 9, 12, 13, 14) by in-person and teleconference training cohorts (Figure 11).

Figure 11. Comparison of scores of perceptions of a productive working alliance with SEC between pre- and post-training for both cohorts of parents and educators.
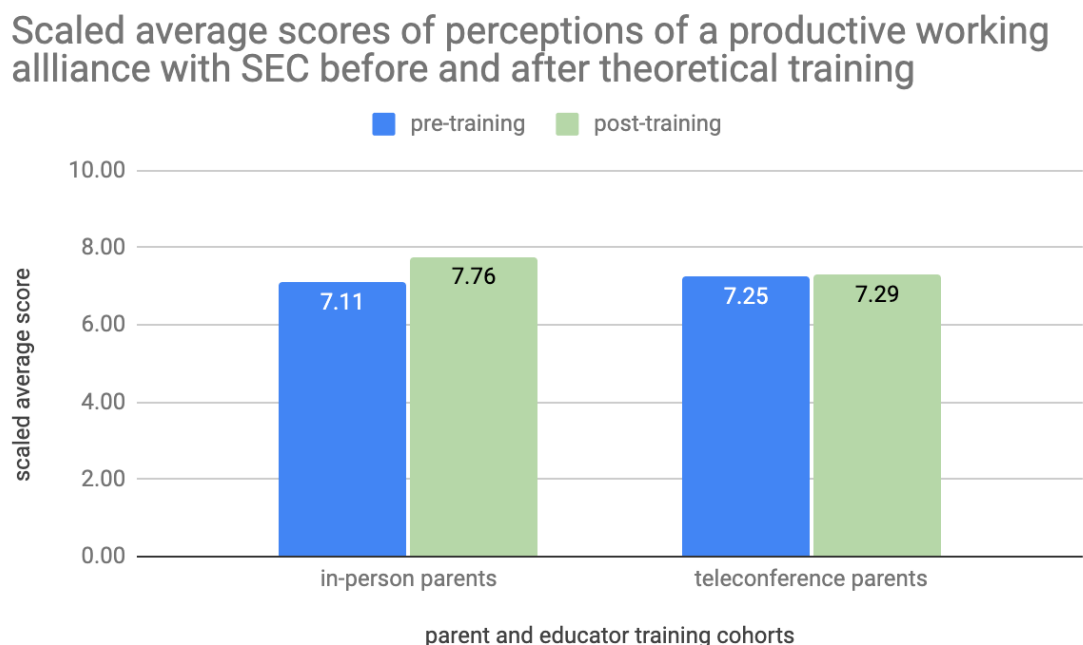
Scaled average scores of perceptions of a productive working allliance with SEC before and after theoretical training

3. Were there statistically significant differences between questionnaire scores by in-person and teleconference training cohorts?

There were no significant differences in composite scores of self-reported instructional efficacy, perception of support and working alliance with SEC from parent and educator questionnaires between in-person and teleconference training groups. However notable significant differences were evident in scores from some individual items (Appendices G and H).

From the post-training condition item seven of the parent questionnaire ("Communication with my child's school and educators is effective") evidenced significantly different scores

between parent cohorts (p =.013), with a mean score of 9.16 for those parents who attended in-person training and 8.1 for those who did so in a teleconference format. In both pre and post training phases, parent in-person scores for item nine ("I know who to communicate with in my child's school if there is any concern about his/her IEP.") were significantly higher than those by the teleconference training parent cohort (p = .034), a finding which remained consistent in the post-training phase (p = .026). Additionally, scores from items 19 ("What is your perception of your child's academic programme?") and 20 ("¿What types of behavioural problems do I see in my home in relation to my child having ASD?") were significantly higher for the teleconference than for the in-person parent training cohort in both pre (p < .001 and p = .001) and post-training (p = .001 and p < .001) conditions (Appendix G).

As far as educator perceptions of their working alliance with SEC, the teleconference group scored significantly higher than the in-person group in the pre-training phase (p = .019), while in the post-training phase the in-person group scored significantly higher than the teleconference group (p = .022). As far as item 11 from the educator questionnaire ("What types of behavioural problems do I see in my students with ASD?"), while the in-person cohort evidenced significantly higher scores in the pre-training phase (p < .001), this difference was not significant between scores in the post-intervention phase.

Discussion

Significant improvements in scores for instructional self-efficacy—understanding and perceived ability to deliver specific interventions—were observed for parents and educators from both in-person and teleconference training cohorts. These improvements aligned with interventions classified under the National Standards Project (NSP) report's Strength of Evidence (SOE) classification system as having robust empirical support. A noticeable increase in scores related to play-based interventions was evident in the teleconference parent cohort but not the in-person cohort, a finding inconsistent with educator questionnaires. Educator questionnaires across both in-person and teleconference training cohorts showed substantial improvement in self-reported understanding of specific play-based strategies, corroborating NSP's SOE classifications.

This suggests a need for further examination of teaching methodologies between in-person and teleconference-delivered sessions, particularly concerning play-based interventions classified under NSP's higher SOE categories. Additionally, considering the pandemic-related lockdown during teleconference training, parents spent significantly more time with their children, presenting more opportunities to implement NSP-classified play-based interventions discussed in theoretical training sessions.

However, while significant increases in perceptions of support provided by Special Education Coordinators (SEC) were detected in educator questionnaires, related constructs from parent questionnaires—perception of support offered by SEC and of a working alliance—did not show significant changes. This discrepancy might be attributed to differences in background knowledge between parents and educators, with educators typically possessing a higher level of specialised knowledge within educational systems. These findings prompt a deeper examination

of the NSP's SOE classification system's recommended strategies for enhancing working

alliances between parents and educators to ensure a more consistent perception of support across

both groups.

Most scores between in-person and teleconference sessions did not demonstrate

significant differences, yet significantly higher parent scores regarding communication with SEC

in the in-person cohort highlighted potential difficulties in communication due to circumstances

of the pandemic-related lockdown, under which parents in the teleconference cohort completed

training. Nevertheless, parents in the teleconference cohort rated their child's academic

programme and types of behavioural problems seen as less severe. This could be attributed to

active parental involvement in implementing NSP-recommended interventions at home during

the lockdown, potentially making them more attuned to positive changes in behavioural

problems and the efforts made by SEC to continue providing educational services during the

national lockdown.

Limitations

The limitations of the current study include the limited nature of the sample of parent and

educator participants, the non-experimental, exploratory design of the study, the types of

outcome measures available for analysis and the availability of follow-up or maintenance data.

While most of the educators who participated in the SEC-ETP Project were instructed to do so,

parent participants did so on a voluntary basis. This inherently yielded a cohort of parent trainees

more likely to participate in such training programmes. Even though some of the results of this

study suggested that levels of parent instructional self-efficacy before training were not

correlated with gains in scores of self-efficacy, controlled studies would have to compare similar

outcomes to those who may be less likely to actively participate in structured training in order to

adequately interpret the gains in parental self-perceived instructional efficacy reported in this study. Finally, absence of follow-up data limits the extent to which these gains could be expected to remain across time, and absence of educator implementation data—parent implementation data is discussed in study II—prevents evaluation of the potential effects of training on the adequate application of interventions in school settings.

Clinical Implications

The need for application of EBIs in home and school settings, relationships between parent and educator confidence in delivering EBIs and child/student outcomes (Dai et al., 2018), and significant increases in scores of instructional self-efficacy in this study highlight the necessity and feasibility for these types of training programmes for students diagnosed with ASD in public school systems in Mexico, and to a limited extent to the wider population of school-age children with ASD. Additionally, educators evidencing more gains from training than parents highlight evidence that parents with children with ASD often become more informed than educators through a multitude of trainings, interventions, and research.

As far as the content and delivery of training, further examination of how play-based interventions were taught to the in-person parent cohort in comparison to the teleconference parent cohort may be necessary to explain the absence of significant improvement in the former.

Regarding the use of a teleconference format to train parents and educators to deliver EBIs in comparison to an in-person format, comparable results by in-person and teleconference parent and educator mixed training cohorts in this study support generalisation of the teaching curriculum implemented in the Project to teleconference formats. This was also supported by the use of teleconference training evaluated by studies reviewed in chapter two, which was found to

be an effective mean for training parents and educators on the implementation of EBIs in home and school settings.

The absence of significant change in parent and educator ratings of behavioural problems seen in home and school may suggest that theoretical training alone is insufficient to transfer relevant knowledge to everyday educational settings.

Despite limitations, results highlight the significance of theoretical training in implementing Evidence-Based Interventions (EBIs) by parents and educators in home and school settings. The findings advocate for the necessity and feasibility of these training programmes for students diagnosed with ASD within the public school systems in Mexico, especially those interventions classified under NSP's higher SOE classifications. However, disparities between parent and educator gains suggest the need for a more comprehensive understanding and implementation of NSP's SOE-recommended strategies that bridge the gap between these two groups.

Research implications

Implications of this analysis are relevant to the generalisation of similar projects in other public and private education systems, the methodologies of research to evaluate such projects and future research on training programmes that implement different combinations of evidence-based interventions.

While this analysis reported gains among parents and educators, avenues for further research are crucial to comprehensively understand these outcomes. Future studies should aim to generalise this training to broader parent and educator populations across Mexican and other international education systems. Randomised-controlled trials (RCTs) comparing outcomes between trained and untrained parents and educators are vital to confirm potential causal

relationships between training and outcome measures, following NSP's SOE classification system for intervention effectiveness. In-depth qualitative feedback analysis from parents and educators can complement quantitative measures, shedding light on measures of instructional efficacy and perceptions of their working relationships post-training, in line with NSP's SOE classifications.

Conclusions

This study further highlights the importance of theoretical training for parents and educators, aligning with NSP's Strength of Evidence classification system for interventions with strong empirical support. While findings support the use of telehealth formats for training, external variables' influence suggests the need for highly controlled studies in interpreting these results. Continued exploration and implementation of NSP-recommended strategies in training programs can bridge gaps between parent and educator gains, fostering more comprehensive and effective ASD interventions in home and school settings.

References

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Chapter 5

Study II: Parent-delivered Interventions

The second phase in the SEC-ETP Project involved practical training and guidance for parents via telehealth to deliver ABA, play-based, and speech-language interventions in the home setting, aligning with the National Standards Project (NSP). This study adopts a mixed-methods, non-experimental exploratory design, analysing qualitative and quantitative data routinely collected by participants, guided by the criteria set by NSP. The data encompasses quantitative measures of student and parent outcomes, along with narrative responses from parents in an exit quality control questionnaire, addressing the NSP's recommended domains for effective interventions in ASD. As detailed in chapter three, the implementation phase occurred between June and September 2020, involving nine ETP supervisors providing guidance and support to parents during their intervention delivery at home, in accordance with NSP guidelines. Supervision sessions, lasting one hour and occurring two to three times per week, included modelling intervention techniques, verbal guidance, and assistance in data collection, adhering to NSP-recommended strategies. Only student participants and their parents referred by SEC and attending some theoretical sessions were included, meeting the NSP's criteria. The main author extracted data for this research purpose, ensuring adherence to NSP standards.

Study Aims

This study aims to comprehensively comprehend parent and student outcomes during the Project's implementation phase, aligning with NSP criteria. Furthermore, it seeks to uncover potential correlations between student and parent-related factors, their significance, and their impact on successful parent-led interventions in this context, considering NSP-recommended factors. These factors encompass parent instructional efficacy, perspectives on the Project,

frequency of interventions delivered, and student outcome measures, reflecting the criteria

highlighted by NSP for effective interventions in ASD.

Table 3 - Research questions, outcome measures and tools for data analysis for Study II.

Research question	Data	Tool for analysis
Parents' ability to deliver interventions		
4. Were there relationships between the number of training hours attended by parents, number of supervision hours and frequency of implementation?	Hours of theoretical training attended by at least one parent. Rating of instructional performance. Scores of instructional self-efficacy by parents.	Bivariate correlation analysis
5. Were there relationships between parent training hours attended and outcomes for students and parents?	Number of hours of theoretical training attended. Number of recorded drills during individualised intervention by parents in the home setting.	Bivariate correlation analysis
6. Were there relationships between supervision hours completed and outcomes for students and parents?		Bivariate correlation analysis
Student outcomes		
7. What were the outcomes for students and parents in this study?	Number of recorded drills during individualised intervention by parents in the home setting. Number of mastered targets during intervention.	Paired-samples, two-tailed t-test

8. Were there relationships between frequency of implementation and outcomes of students and parents?	CARS-2 severity scores obtained before and after the implementation phase of the Project.	Bivariate correlation analysis
9. Were there evident relationships between parent and student outcome measures?		Bivariate correlation analysis
10. Were there relationships between parent instructional self-efficacy scores and scores from the NGSE?		Bivariate correlation analysis
Parent perceptions of aspects of the SEC-ETP Project.		
11. Which aspects of the SEC-ETP Project should remain or change according to the views of parent participants?	Narrative answers to questions in the quality-control questionnaires: 1. What are the aspects of the SEC-ETP Project's implementation phase parents found most effective? 2. Why did you find these aspects effective?	Reflexive thematic analysis of parents' responses

	3. What are the aspects of the SEC-ETP Project's implementation phase parents found least effective or in need of improvement? 4. Why did you find these aspects as ineffective or in need of improvement?	

Method

Design

A within-group, non-experimental mixed-methods model of research was used to analyse quantitative and qualitative data extracted from the SEC-ETP Project for the purposes of this study. This analysis was aimed at providing insight into specific areas of interest which included parent and student outcomes, parent's ability to deliver interventions and aspects of the SEC-ETP Project they considered important (Table 3). In order to effectively use data extracted to explore these areas two separate philosophical perspectives were adopted; a positivist paradigm was used to analyse and interpret quantitative data, while a post-positivist, constructivist paradigm was used for the analysis and interpretation of qualitative data.

Mixed-methods research

Mixed-methods research, which combines both qualitative and quantitative data collection and analysis, was determined useful in accounting for the experiences of parents trained to deliver interventions to their own children in their own home. This approach allowed for the triangulation and integration of results from this research, providing a more

comprehensive and nuanced understanding of the project and its impacts on child outcomes and parent views (Shorten & Smith, 2017).

The relevance of mixed-methods research in this context is that it can provide a more comprehensive and holistic understanding of the project and its impacts (Creswell, J. W. & Creswell, 2018). By analysing quantitative and qualitative data, the project can be examined from multiple perspectives and consider a range of variables and factors that may influence the outcomes and experiences of the parents and children. While quantitative data may provide information on student, parent and educator outcomes (e.g. rated self-perceptions of instructional efficacy, ASD severity scores), analysis of qualitative data may provide insights into the parents' experiences and perceptions of the project, such as their level of engagement or satisfaction, and what parents considered important in regards to the Project. By combining these different sources of data, this study aims to gain a more complete and detailed understanding of the project and its impacts.

As described, mixed-methods research can be useful in this context by providing a more robust and rigorous evaluation of the Project. By using multiple methods of data collection and analysis, the reliability and validity of the findings can be further supported. For example, the use of quantitative methods such as standardised assessments (e.g. CARS-2 scores) can help to control for bias and increase the accuracy of the measurement of child outcomes (Creswell, John W. & Clark, 2017). At the same time, the use of qualitative methods, in this case narrative written responses, can provide a different type of insights into the parents' experiences and perspectives that may not be captured by quantitative measures alone, and may provide support in confirming, discarding or otherwise explaining outcomes from such measures (Shorten & Smith, 2017). By collecting and analysing both quantitative and qualitative data, emerging

themes can be compared to patterns that emerge from the data, facilitating the exploration of the relationships between different variables.

Development of a Digital Platform for Data Collection and Analysis

The design of the software used for different aspects of the training and implementation phases of the SEC-ETP Project was initially prompted by a need to provide evidence-based, well-documented and rigorous intervention to a group of six children diagnosed with autism spectrum disorder (ASD) at TruePotential PLLC in 2012. Up to that point, the digital tools available for the electronic data collection were emerging, and intervention data from intensive ABA programmes was often collected via standard pen-and-paper practices. Since then, electronic data collection practices have become the norm; also, *therapyConnect* has evolved through a process involving user feedback and periodic software updates in order to adapt to the needs of multiple intervention programs across sites in different geographical locations. The following is an account of *therapyConnect's* inception and development, as well as its functions and their use as relevant to the training and implementation phases of the SEC-ETP Project.

The need for *therapyConnect* arose from the author's experiences with traditional data collection and interpretation practices that relied on paper-and-pen methods and filing systems. Families and intervention teams were trained on these practices, which took the form of binders divided into different sections. Each binder was in the possession of the family, and each section within each binder contained printed spreadsheets where implementation data for a specific intervention goal was recorded; the binder also included a cover sheet with instructions for the programme in a discrete-trial format, outlining the discriminative stimulus, expected response, materials, and cueing strategies, along with any other notes, considerations, or instructions. Printed spreadsheets were used to record intervention data. For each line of data, the

implementer included their initials, the date the drill was administered, and a breakdown of

targets marked with + for independent, p for prompted, and - for incorrect responses, finally

calculating and logging a percentage based on the number of independent, correct responses. The

visual organisation of data allowed for the inspection of percentages across instances of delivery

(drills), trends in responses to specific targets, and the frequency of intervention delivery.

Narrative data included handwritten summaries of the intervention sessions, which summarised

relevant aspects such as levels of engagement and changes to intervention targets. Before each

session, instructors were trained to review quantitative and qualitative data collected since the

last time they provided interventions. This allowed instructors to remain aware of changes to

interventions throughout implementation, as well as progress made, and obstacles encountered

and their solutions. During weekly meetings, families and teams reviewed the implementation of

interventions by reviewing each section in the binder, raising concerns, sharing intervention

strategies, and asking further questions that would be forwarded to the assigned behavioural

consultant for additional guidance as needed.

The author also used similar data collection practices while developing individualised

interventions as a speech-language pathologist. During his work delivering home-based speech-

language therapy services in Arizona from 2008 to 2011, he also specialised in providing

services for children with ASD and their families. He would do so in the same manner, by

providing families with binders containing sections for intervention programmes addressing

goals from their individualised service plan. In this binder data would be recorded when

provided by the author or family members, as he trained parents on the use of the binder to

deliver interventions in his absence. During his work as a speech-language pathologist for the

Tucson Unified School District from 2007 to 2011, he used similar methods to track

interventions provided by implementers of interventions in-school settings, and to record and analyse such data for the purposes of presenting quarterly or annual individualised service plan reviews.

The development of *therapyConnect* began four years after the establishment of the author's first private practice clinic in 2008, as an increasing number of families required intensive, individualised intervention plans. *therapyConnect* was developed to be a user-friendly tool for the collection, analysis, and interpretation of intervention data for individuals with ASD or in otherwise need for a means to collect and interpret many data points across many interventions. Its development began in the fall of 2012 and was led by the author, with input from other members of the clinical team at TruePotential PLLC team. The initial version of *therapyConnect* was completed in the spring of 2013 and was deployed for use in data collection for all TruePotential PLLC's therapeutic programmes.

therapyConnect was designed to be a cloud-based platform, allowing for access from any device with an internet connection. It is a secure platform that requires login credentials for access. The platform includes a variety of functions, including the creation of individualised intervention plans, tracking of intervention data, and the ability to generate reports for review by families and the multidisciplinary team. *therapyConnect* also includes a messaging function for communication between team members, as well as the ability to upload and store documents related to the individual's intervention plan.

The evolution of *therapyConnect* has since continued; the software has been updated numerous times based on user feedback and technical requirements, often resulting in the addition of new features or modifications to existing ones to improve functionality and efficiency. At the time this work was written, *therapyConnect* included a range of tools such as a

caseload management tool, data collection interface, protocol registration tool, behaviour episode tracker, contact note and progress report writing tools, and a course platform. These tools were used by parents and supervisors during some of the implementation and training phases of the SEC-ETP Project.

In 2016, the ETP Instructor Training Course experienced increased demand, prompting the development of a digital course platform to improve the efficiency with which the training team managed large groups of parent and educator trainees. The course platform in *therapyConnect* includes interfaces where students can view their course materials, complete course exams, view evaluations of their own instructional performance, and generate their training certificates.

Ethical Approval

Informed Consent for participation in this study was provided by parent participants for themselves and their children prior to participation in theoretical training sessions (Appendix L). Ethical approval for these studies was granted by the Salomon's Centre for Applied Psychology Board of Ethics (Application ETH1920-0116).

Sample

A total of 25 student participants were included from the 44 total students included in the implementation phase of the SEC-ETP Project. They ranged in age from 3.3 to 15 years of age (M = 8.2, SD = 2.7), 7 students were enrolled in special education services and 18 in a regular education placement. As it is common across groups of autistic individuals (Bruining et al., 2010) there was a wide variety of personality and characteristics between participants. From these participants, at the onset of intervention 17 displayed use of verbal behaviour (consistent

use of symbolic means to communicate such as speech, sign language, writing or any other symbol-based communication system), nine students evidenced comorbidities including attention-deficit and hyperactivity disorder (ADHD), intellectual disability or cerebral palsy (CP), and 14 were under behaviour-modification pharmacological treatment at the time the study took place, this included methylphenidate for ADHD and risperidone for irritability. Student participants' educational placement ranged from preschool to secondary school. Due to public health COVID-19 contingencies, regular and special educational services for all students during the time this intervention took place were provided via telehealth. During this time students who participated in regular education did so by interacting with the classroom teacher and classmates via camera and microphone, in a virtual classroom format and those receiving special education services did so indirectly (e.g., provided with structured tasks by their classroom teacher virtually to be completed with their parents at home).

Outcome Measures

Areas of interest explored by systematic analysis of quantitative and qualitative data collected from the implementation phase of the SEC-ETP Project included factors related to student outcome, as well as parent participants' ability to deliver interventions in the home setting. Quantitative and qualitative data analysed in this study were routinely collected as part of the methodology of the *Project*, and subsequently extracted by the author for the purposes of this research. (Table 3) outlines the research questions used to address these areas, as well as the data extracted and the tools for its analysis in order to answer each question.

Intervention data

Intervention data collected during the twenty-week period was extracted from the central database via the digital platform into spreadsheet format by the author for purposes of this

research (see chapter four). This data included number of hours of supervision sessions, the total

number of days intervention lasted, amount of programmes* within the student's individualised

education plan (IEP), number of targets* acquired from all programmes in the IEP, number of

drills and trials recorded, average trials per drill, average trials per day and average drills per day

recorded. Table 4 outlines descriptive information for this data.

Table 4. Descriptive statistical information from quantitative data collected for student

participants (n = 25).

Quantitative measure	Range	Mean	SD
Supervision hours	0.7 - 2.65	2.03	.56
Length of intervention (in days)	101 - 164	143.52	16.96
Number of programmes	3 - 20	7.88	3.73
Number of acquired targets	1 - 390	75.24	87.29
Total number of trials	125 - 5033	1006.88	1026.38
Total number of drills	70 - 2386	383.88	457.55
Average trials per drill	1.39 - 3.43	2.64	.63
Average trials per day	1.33 - 31.46	6.63	6.62
Average drills per day	.55 - 14.91	2.53	2.82

Scores of ASD severity

The CARS-2 (Reichler & Renner, 1986) is a scale that rates 15 items within the three

different behavioural/emotional domains of social impairment, negative emotionality and

distorted sensory response (Dilalla & Rogers, 1994; Schopler et al., 1980). The items are *relating*

to people, *imitation*, *emotional response*, *body use*, *object use*, *adaptation to change*, *visual*

response, *listening response*, *taste*, *smell* and *touch response*, *fear or nervousness*, *verbal*

communication, *nonverbal communication*, *activity level*, *level and consistency of intellectual*

response and general impressions (Schopler et al., 1980). Each item is marked with 1 for

"normal", 2 as "mildly abnormal", 3 as "moderately abnormal" and 4 "severely abnormal", with

1.5, 2.5 and 3.5 ratings for marks between categories. It is administered by professionals

experienced in implementation of intervention programmes for individuals diagnosed with ASD

(Hedley, Young, Angelica, Gallegos, & Salazar, 2010) after a period of direct observation along

with information gathering tools such as thorough case histories, interviews (Moulton, Bradbury,

Barton, & Fein, 2019) and additional observation periods or assessment instruments as needed

(Hojjati & Khalilkhaneh, 2017).

A study of 143 children, 43 of which were diagnosed with ASD, found respectively,

CARS specificity and sensitivity levels at .71 and .93, respectively, for detecting diagnosed and

undiagnosed children (Wiggins & Robins, 2008), and a study in Mexico found significant levels

of concurrent validity between the CARS (Hedley et al., 2010) and other measures including the

Spanish translation of the Autism Detection in Early Childhood (ADEC-SP) and the Autism

Diagnostic Interview - Revised (ADI-R).

The CARS-2 has also been used to evaluate the effect of medical pharmacological

intervention. In a study by Du and colleagues (Du et al., 2015) where a treatment group (n = 32,

mean age = 4.5 years) received ABA and bumetanide treatment and a control group (n = 28,

mean age = 4.5 years) received only ABA intervention over a three-month period, CARS-2

scores showed significant improvement in both groups after a three-month period. The difference

between was markedly more statistically for the Autism Behaviour Checklist (ABC) and the

Clinical Global Impressions (CGI), which were done concurrently and did evidence significant

differences in improvement between groups, with the combined group evidencing better outcome. The CARS-2 has also been shown sensitive to progress in ASD symptomatology over time in a study of adolescents and adults (Mesibov, Schopler, Schaffer, & Michal, 1989) and in a 3-year study of 208 children under the age of seven diagnosed with ASD (Darrou et al., 2010).

CARS-2 assessments were completed by supervisors by using information collected during at least two observations and at least one parent interview. Each item included a narrative description of the behaviour that corresponded to the rating assigned by the supervisor (i.e. a rating of 2.5 under Imitation was accompanied by the description: "When attempting to imitate gross, facial and fine motor movements intermittent attempts were observed with need for direct cueing. Attention periods during imitation tasks lasted between one and two seconds").

Interrater reliability

During the second and post-intervention administration of the CARS-2 the test was administered to 42% of student participants (n = 14) by two different supervisors. The Pearson correlation test of these results suggested a high degree of agreement (r(13) = .968, p = .001) between CARS-2 ratings when applied by two different supervisors. Every supervisor at the time of the Project had the experience of at least three years of at least part-time work implementing and supervising the implementation of intervention programmes for individuals diagnosed with ASD. Additionally, prior to intervention supervisors were provided with a two-hour training on observation and interviewing protocols for the purposes of administering the CARS-2. This training was provided by the main researcher, who at the time of the Project's implementation had accumulated 18 years of experience delivering applied behaviour analysis and play-based interventions to children diagnosed with ASD and had assisted and directed in the design and implementation of a variety of intensive behavioural intervention programmes for autistic

students in Mexico and the United States. Training on CARS-2 administration included a review

of developmental milestones from the preschool to the primary school age, as well as the

characteristics of ASD symptomatology across developmental areas (i.e. speech and language,

social behaviour, motor and sensory disturbances).

Attendance Data

Attendance data from theoretical training was extracted by reviewing physical records

from sessions that took place between October and December of 2019 in the municipalities of

Ciudad Obregon, Hermosillo and Nogales in the State of Sonora, Mexico. Even though parents'

attendance to the theoretical training modules previous to the implementation phase subject of

this study was required from parents by SEC, most parents were included in this phase of the

Project regardless of theoretical training sessions (with the exception of parents who declined

participation in the implementation phase of the Project).

Parent instructional self-efficacy scores

In order to evaluate changes in parent perceptions of their own instructional efficacy in

relation to student outcomes as well as a potential relationship with student outcomes, answers

related to instruction self-efficacy from the Questionnaire of Instructional Efficacy (Appendix C)

were analysed statistically to determine whether there was a relationship between with student

outcomes, as well as significant improvement in measures of parent instructional self-efficacy

before the implementation period. A final comparison is also offered between scores obtained

pre and post training (subject of study I) and after the implementation period subject of the

current study.

The Parent Questionnaire of Instructional Efficacy was written by the main researcher

and approved by SEC prior to the first iteration of the SEC-ETP Project, and since has been

completed by parents before and after every training and implementation period. It contains twenty questions divided in three general categories named each after the previously named constructs; eight items belong to Parent Perceptions of Instructional Self-Efficacy, six items to Parent Perceptions of Instructional Educator Efficacy, four to Communication Practices with Educators and two additional items to the category General Outcomes. A study of the content validity and reliability of the Parent Questionnaire of Instructional Efficacy is included in Study I.

Responses to the eight items within the category of Perceptions of Instructional Self-Efficacy (Appendix C) include the statements "I feel I am an active member in my child 's special education team", "I have received sufficient training about the educational and therapeutic attention my child needs", "I understand my child's Individualised Education Plan", "I have the knowledge to exercise play-based interventions that allow me to establish a positive relationship with my child", "I have the knowledge to analyse and modify inappropriate behaviours in my child", "I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively", "I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain my child's attention and motivation" and "I understand the use of Discrete Trial Teaching in relation to specific skills in home and school environments". Parents responded to each item by selecting a number between 1 and 10 within a Likert-style scale where 1 meant "strongly disagree" and 10 meant "strongly agree".

The results of questionnaires of instructional self-efficacy completed by parents before the implementation period were extracted manually by copying scores from each questionnaire

into an excel spreadsheet. The results obtained when this questionnaire was administered after the current implementation phase were extracted from the centralised electronic database as they were completed via the digital platform for the project.

Ratings of Observed Parent Instructional Performance

Scores from the Instructional Performance Checklist (Appendix K) were extracted for analysis. This is a checklist routinely completed after every intervention phase of the SEC-ETP Project, and it is used to provide a quantitative account of observed instructional performance by parents as they delivered interventions in their home. It includes a total of 39 items completed by assigned supervisors in the Project after a 60-minute observation of the parent while delivering interventions. Items belong to the categories session and materials preparation, instructional proficiency (Koegel, Russo, & Rincover, 1977; Lovaas, 1981; Lovaas, 1993) play-based technique (Greenspan, Stanley & Wieder, 1998; Greenspan, Stanley I. & Wieder, 1999) and use of communication-based strategies (Brian, Smith, Zwaigenbaum, Roberts, & Bryson, 2016). It was developed by the clinical team at ETP for the evaluation of programme delivery by trained instructors and parents (McClannahan & Krantz, 1993), and based on instructional competencies within domains of discrete-trial teaching and use of play-based strategies. Each of the items is rated on a 5-point likert-type scale where 1 stands for "Support is not enough or displays resistance", 2 for "Requires teamwork at all times", 3 for "Requires moderate support", 4 for "Satisfactory with support" and 5 with "Independent".

The New General Self-Efficacy Scale (NGSE)

The NGSE (Chen et al., 2001; Appendix J) was the only measure extraordinary to the routine assessment, intervention and training processes of the SEC-ETP Project, and administered in order to identify potential concurrent validity with the eight items within the category of self-

Perceptions of Instructional Efficacy in the *Parent Questionnaire of Instructional Efficacy*, which were used as a measure of parent perceptions of instructional self-efficacy in this study.

From the three conditions (pre-training, post-training, and post-implementation), the New General Questionnaire of Self-Efficacy (NGSE) was administered in the pre-implementation and post-implementation conditions. It is important to note that the post-training and pre-implementation conditions were approximately four months apart, respectively from December of 2019 to April of 2020 (Figure 1). Paired, two-tailed, t-test analyses were used to assess mean differences between scores from the NGSE in pre-implementation and post-implementation conditions. Bivariate correlational analysis was used to investigate potential relationships with scores from the parent questionnaire of self-efficacy.

Parent answers to questions regarding their views on aspects of the SEC-ETP Project

The questionnaire parents completed after the conclusion of the implementation phase of the Project included four open-ended questions directed at exploring aspects of the SEC-ETP Project parents found effective or ineffective/in need of improvement (Table 3). Parents completed these questionnaires from their home and in their own time by using the Project website. Fields for each response had a maximum limit of 3000 characters; however most responses were much shorter. Responses were extracted by the main researcher as a spreadsheet file from the central project database.

Data extraction and analysis

Quantitative and qualitative data was extracted after informed consent was obtained by the author from participants for inclusion in this study. With the exception of the New-General Self-efficacy Scale (Chen et al., 2001), which was added before and after the implementation

phase of the Project, all measures were collected routinely as part of the training and implementation processes of the SEC-ETP Project and determined well-before the conception of the current studies. Statistical methods including two-tailed t-tests and bivariate correlation analyses were used to analyse quantitative data, while a reflexive thematic analysis approach (Braun & Clarke, 2019) was adopted for the analysis of qualitative data (Table 3).

Parents self-perception scores of instructional efficacy

Bivariate correlation analysis was used to identify potential relationships between the number of hours of parent training, number of supervision hours, ratings of observed and self-reported instructional efficacy, as well as between number of training hours and measures of intervention frequency. Paired-samples t-test was used to evaluate the significance of changes in scores of observed and self-reported instructional efficacy between pre and post-intervention conditions.

Student outcomes

Relationships between student outcomes and other parent and student outcomes, as well as with measures of intervention frequency were evaluated via bivariate correlation analysis. Paired samples two-tailed t-tests were used to evaluate the significance of changes in CARS-2 composite and subitem scores between pre to post-intervention conditions (Table 8).

Parent perceptions of important aspects of the SEC-ETP Project

Analysis of narrative answers to the quality control questionnaire completed by parents (Appendix N) was approached through a process of reflexive thematic analysis methodology (Braun 2019). Reflexive thematic analysis was found suitable for analysis of this data for three main reasons: (1) identification of themes from narrative data can yield a nuanced interpretation of data beyond the literal meaning of parents' answers and the primary scope of the

questionnaire; (2) it is an opportunity to actively include the subjective views of parents about the SEC-ETP Project; (3) to account for the context in which interventions were delivered; and (4) account for the influence of the author's views, perspectives, and biases on the process of analysis and interpretation of data (Figure 12).

As part of the design of the Project, questions in the quality control questionnaire were aimed at identifying aspects of the project which parents found effective or ineffective. However, application of reflexive thematic analysis to this narrative data facilitated an exploration beyond aspects of the Project in need of change, and into additional aspects of intervention parents found important. By being aware and reflexive of parents' roles as interventionists, the author aimed for the voices and perspectives of parent participants to be heard and represented in a respectful and authentic way (Braun & Clarke, 2019). Inclusion of social, cultural, and otherwise factors that may have impacted parents' experiences and views was included by considering environmental factors relevant to the processes of parent-delivered intervention (e.g., the pandemic-related lockdown during which parents provided interventions). Finally, the author considered his specific views, perspectives, and biases before drawing meaning from each statement at all steps in the process. This was of particular importance in aiming to mitigate the risk of unknowingly imposing his views and biases, therefore supporting the credibility and trustworthiness of the findings (Braun & Clarke, 2019). Chapter two described the process of identification of author's views and biases relevant to this work.

The systematic process of reflexive thematic analysis involved five steps: (1) familiarisation with the data; (2) coding of key statements; (3) generation of initial themes; (4) identification of overarching themes; and (5) documentation of evidenced results (Braun and Clarke 2006). During the analysis, the researcher focused on both the manifest and latent content

of the statements, codes, and themes. Manifest content refers to the explicit, surface-level meaning of the data, while latent content refers to the underlying, hidden meanings or themes. While manifest content was mostly helpful in identifying codes and themes related to aspects of the Project parents found effective or ineffective and the reasons for this, latent content was mostly helpful in identifying codes or themes beyond the immediate scope of such aspects.

Figure 12. Process engaged by the author during analysis, it includes the five main components of the process, as well as the steps involved in the process of reflection through which codes and themes were identified.
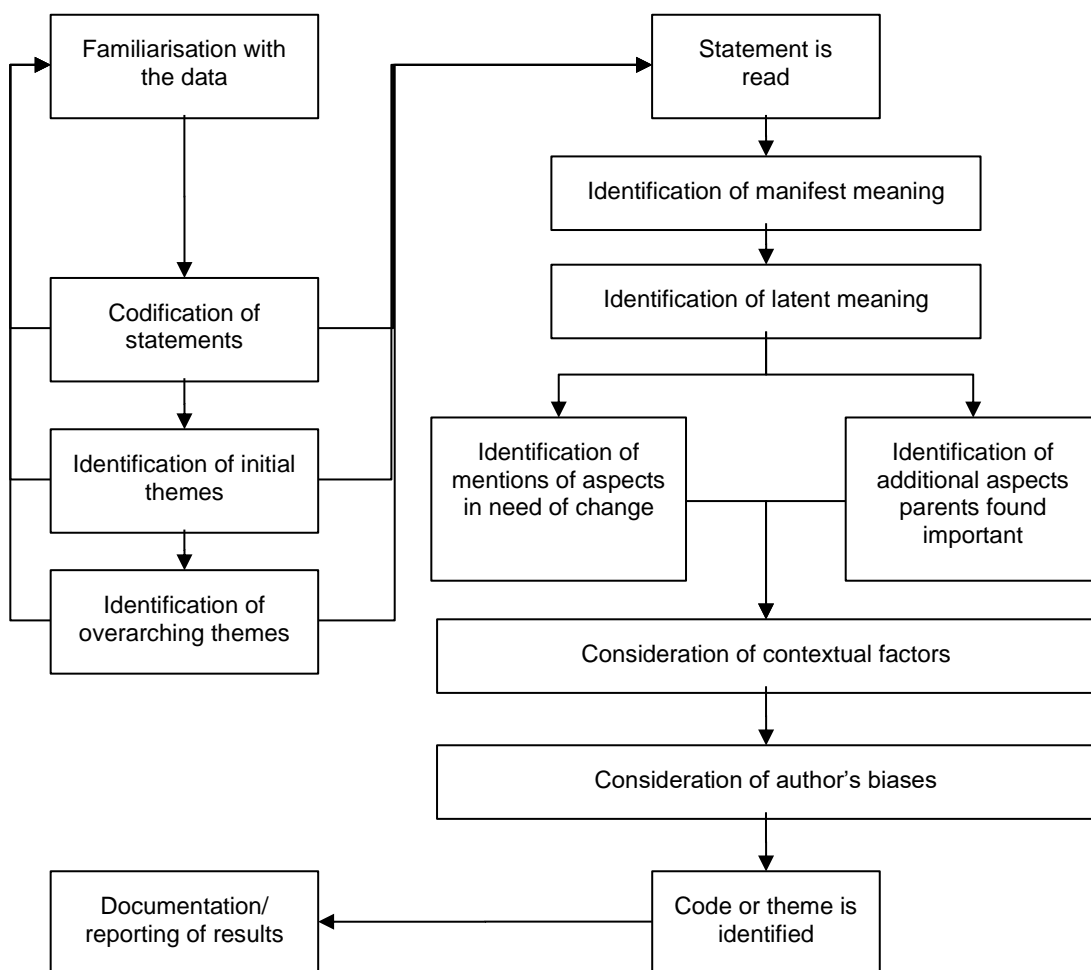
The author familiarised himself and became sensitive to the content and general depth or responses (Vaismoradi et al., 2013) by reading all responses a handful of times. During this process a total of 129 key statements derived from all responses were identified. During the second step in the process key statements were then engaged by the author individually, by identifying emerging codes based mainly on both manifest (semantic, surface-based) and latent (hidden or nonliteral) content of statements; this process was repeated several times and codes were revised, even after themes were generated through the following steps in the process. During the third step the author generated themes by reviewing and refining the initial codes and identifying the manifest and latent content which emerged from the data. This involved grouping similar codes together, eliminating redundant codes, and defining the themes in more detail. The fourth step involved reviewing themes and theme definition and renaming them as needed to ensure that they accurately captured the essence of the data. This involved clarifying the boundaries of the themes, adding or deleting subthemes, and renaming themes as needed. Similar to the coding process, themes and overarching themes were identified through application of this process. Finally, a written analysis of the findings from this analysis was produced and included in the following chapter. Identified themes are discussed in light of their relevance to the SEC-ETP Project and parent training practices in the Project and in general.

Findings

Notable findings from this study include the absence of significant changes in composite and most subscores of ASD severity, as well as significant changes in measures of parent observed instructional efficacy and no significant changes in measures of self-reported instructional efficacy. Findings also include potential relationships between measures of frequency of delivery of interventions, as well as with and between student and parent outcomes, which highlight the implications of these findings to clinical practice and research.

4. Were there relationships between the number of training hours attended by parents, number of supervision hours and frequency of implementation?

There were no correlations evident between hours of training attended by parents during the previous phase of the project—subject of Study I— and number of supervision hours received ($r = -.002$, N = 25, $p = .993$), nor with measures of frequency of delivered interventions measured in number of total trials, total drills, average trials per day, average drills per day, or average trials per drill (Table 5). A positive correlation was found between the number of supervision hours received and two measures of frequency of implementation: number of total trials recorded and average number of trials recorded per day.

Table 5. Correlational analysis between training and supervision hours, and measures of frequency of delivery of intervention.

	Training hours	Supervision hours

	Pearson r (N = 25)	p value	Pearson r (N = 25)	p value
Total trials	r = .017	p = .934	r = .437*	p = .029
Total drills	r = .034	p = .873	r = .368	p = .070
Average trials/day	r = .027	p = .900	r = .434*	p = .030
Average drills/day	r = .044	p = .835	r = .364	p = .074
Average trials/drill	r = -.338	p = .098	r = .032	p = .878

Based on this information it appears that while the number of hours parents attended training did not appear to be related to how often interventions were delivered, it was the amount of supervision hours which evidenced a potential relationship with measures of total amount of frequency recorded (Figure 14).

Figure 14. Diagram of correlational analysis between parent training, hours of supervision and measures of frequency of delivered interventions.
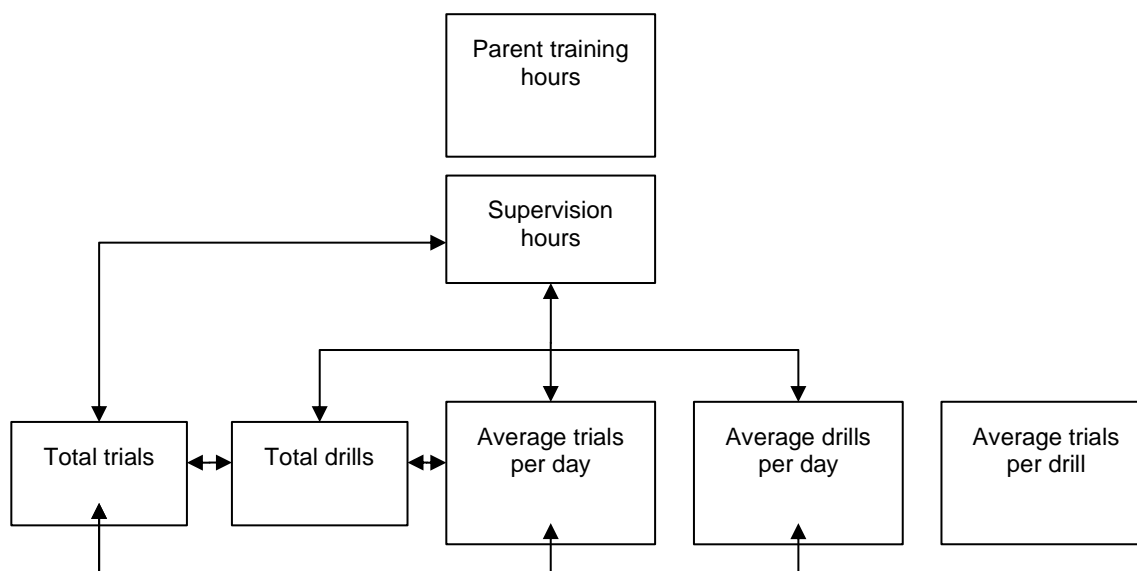
5. Were there relationships between parent training hours attended and outcomes for students and parents?

No correlations were detected between the number of parent training hours and CARS-2 composite scores before or after intervention, however training hours were found positive correlated with scores for item six (*adaptation to change*) from the second administration of the CARS-2 (r = .442, p = .036, n = 25)—but not with mean improvements in these scores—, which was the only subitem that evidenced statistically significant improvement from pre to post-implementation (Table 7). No correlation between the number of parent training hours attended and number of mastered targets or introduced programmes was detected. Concerning parent instructional efficacy, the number of hours parents attended training were not related to the scores from the first administration of the instructional performance checklist, however they were positively correlated with scores from its second administration (r = .584, p = .005, n = 25), as well as with mean increases in these scores (r = .397, p = .05, n = 25) which were found statistically significant (Table 6).

Table 6. Results of correlational analysis between training hours attended and parent and student outcomes.

	Pearson r (N = 25)	p value
CARS-2 composite scores pre-implementation	r = -.170	p = .418
CARS-2 composite scores post-implementation	r = -.037	p = .862
Adaptation to change average scores pre-implementation	r = .117	p = .577
Adaptation to change average scores post-implementation	r = .422	p = .036*
Average changes in *adaptation to change* scores	r = -.325	p = .113
Number of mastered targets	r = .081	p = .701
Number of introduced programmes	r = .195	p = .351
Self-reported self-efficacy scores pre-training	r = -.163	p = .547
Self-reported self-efficacy scores post-training	r = .392	p = .133
Self-reported self-efficacy scores post-implementation	r = -.228	p = .414

Average changes between pre-training and post-training self-efficacy scores	r = .318	p = .230
Observed self-efficacy scores pre-implementation	r = .239	p = .249
Observed self-efficacy scores post-implementation	r = .584	p = .002*
Average changes between pre-implementation and post-implementation observed instructional efficacy scores	r = .397	p = .050*

6. Were there relationships between supervision hours completed and outcomes for students and parents?

Concerning student outcomes, number of supervision hours were not correlated to composite or subscale scores from the CARS-2 to the number of targets mastered or the number of targeted programmes. There were no correlations detected between the number of supervision hours and scores from the three administrations questionnaires of parent instructional self-efficacy, the two observed ratings of instructional performance or the mean differences between these scores across time (Figure 14).

Table 7. Results of correlational analysis between supervision hours received and parent and student outcomes.

	Pearson r (N = 25)	p value
CARS-2 composite scores pre-implementation	r = -.179	p = .392
CARS-2 composite scores post-implementation	r = -.058	p = .784
Adaptation to change average scores pre-implementation	r = -.153	p = .467
Adaptation to change average scores post-implementation	r = .177	p = .398
Average changes in *adaptation to change* scores	r = -.322	p = .116
Number of mastered targets	r = .320	p = .119

Number of introduced programmes	r = .290	p = .159
Self-reported self-efficacy scores pre-training	r = .094	p = .730
Self-reported self-efficacy scores post-training	r = .116	p = .668
Self-reported self-efficacy scores post-implementation	r = -.243	p = .382
Average changes between pre-training and post-training self-efficacy scores	r = -.044	p = .871
Observed self-efficacy scores pre-implementation	r = .135	p = .521
Observed self-efficacy scores post-implementation	r = .270	p = .192
Average changes between pre-implementation and post-implementation observed instructional efficacy scores	r = .160	p = .445

Figure 14. Diagram of correlational analysis between parent training, hours of supervision and student and parent outcomes.
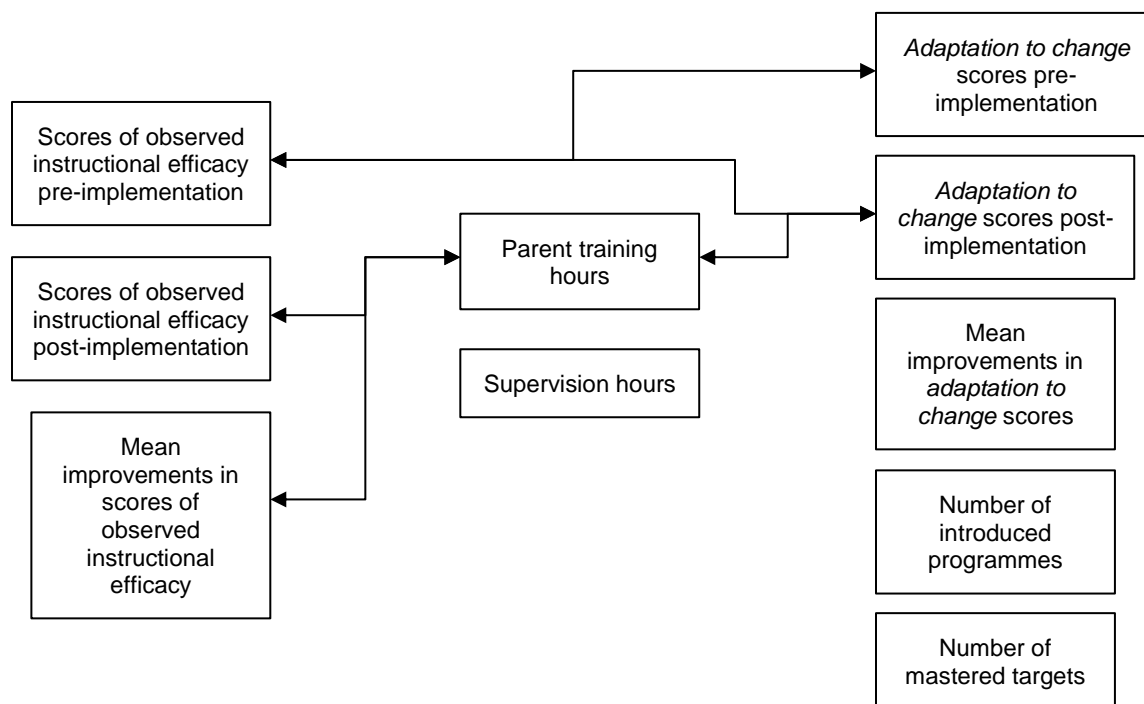
7. What were the outcomes for students and parents in this study?

There were no significant improvements in ASD severity scores between pre and post-intervention periods; there were some notable relationships between measures of frequency of

intervention and number of specific acquired skills. No significant changes were detected

between composite scores from the CARS-2 from pre to post-implementation conditions. The

same was true for all sub scores of the CARS-2 with the exception of *adaptation to change* (item

6) for which statistically significant improvement was detected (M = .44 ± .15, t = 2.971, n = 25,

p = .007).

Table 8. Results of paired, double-tailed t-test comparisons between pre- and post-implementation
administration of the CARS-2.

	Mean difference	Pearson r (N = 25)	p value
Composite scores	M = 1.48 ± .75	t(24) = -1.976	p = .060
1. Relating to people	M = -.08 ± .12	t(24) = -.641	p = .527
2. Imitation	M = .16 ± .36	t(24) = .443	p = .662
3. Emotional response	M = -.10 ± .12	t(24) = -.840	p = .409
4. Body use	M = .02 ± .11	t(24) = .189	p = .852
5. Object use	M = -.20 ± .12	t(24) = -1.680	p = .106
6. Adaptation to change	M = -.44 ± .15	t(24) = -2.971	p = .007*
7. Visual response	M = -.06 ± .11	t(24) = -.531	p = .600
8. Listening response	M = -.14 ± .07	t(24) = -1.899	p = .070
9. Taste, smell, and touch response	M = .02 ± .08	t(24) = .238	p = .814
10. Fear or nervousness	M = -.28 ± .14	t(24) = -2.019	p = .055
11. Verbal communication	M = -.18 ± .09	t(24) = -1.890	p = .071
12. Nonverbal communication	M = -.08 ± .10	t(24) = -.778	p = .444

13. Activity level	M = .04 ± .09	t(24) = 419	p = .679
14. Level and consistency of intellectual response	M = -.08 ± .07	t(24) = -1.072	p = .294
15. General impressions	M = -.08 ± .07	t(24) = -1.163	p = .256

As far as instructional efficacy, while significant increases in observed instructional performance scores were found from pre to the post-implementation conditions, differences between self-reported scores of instructional efficacy between post-training and post-implementation conditions were not statistically significant. However, post-implementation, self-reported instructional efficacy scores—consistent with those obtained pre-implementation—remained statistically higher than those in the pre-training condition (Table 9).

Table 9. Mean differences between measures of parent and student outcomes at pre-training, post-training and post-implementation phases of the *Project*.

Measure	Mean differences from pre to post-training	Mean differences from post-training to post-implementation	Mean differences from pre-training to post-intervention
Self-reported instructional efficacy	M = 14.63 ± 4.32 (SE), n = 16 p = .004*	M = 1.93 ± 2.77 (SE), n = 15 p = .497	M = 18.00 ± 4.40 (SE), n = 15 p = .001*
Observed instructional efficacy	——	M = 11.12 ± 4.41 (SE), n = 25 p = .019*	——
CARS-2 composite scores	——	M = 1.48 ± .75 (SE), n = 25 p = .060	——
CARS-2 subitem six scores (*adaptation to change*)	——	M = 0.44 ± .012 (SE), n = 25 p = .007*	——

* Values considered significant per two-tailed testing with a 80% confidence interval (CI).

8. Were there relationships between frequency of implementation and outcomes of students and parents?

Apparent relationships were evident between measures of frequency of implementation and some student outcomes; no correlations between frequency and parent outcomes were detected (Table 10). Number of total drills and trials, as well as average trials per day and average drills per day were positively correlated with the number of mastered targets and targeted programmes. However, they were not related to the composite or sub scores from either administration of the CARS-2. No correlations were detected between measures of frequency of intervention and self-efficacy scores or observed ratings of instructional performance before or after implementation.

Table 10. Results of correlational analysis between measures of intervention frequency and parent and student outcomes.

	Total trials		Total drills		Average trials/day		Average drill/day		Average trials/drill	
CARS-2 composite scores pre-implementation	r = .091 (N = 25)	p = .665	r = .052 (N = 25)	p = .803	r = .075 (N = 25)	p = .722	r = .035 (N = 25)	p = .869	r = .448 (N = 25)	p = .025*
CARS-2 composite scores post-implementation	r = -.006 (N = 25)	p = .977	r = -.038 (N = 25)	p = .858	r = -.011 (N = 25)	p = .957	r = -.046 (N = 25)	p = .826	r = .376 (N = 25)	p = .064
Adaptation to change average scores pre-implementation	r = .077 (N = 25)	p = .714	r = .070 (N = 25)	p = .738	r = .072 (N = 25)	p = .732	r = .065 (N = 25)	p = .758	r = .157 (N = 25)	p = .455
Adaptation to change average scores post-implementation	r = -.016 (N = 25)	p = .940	r = .011 (N = 25)	p = .958	r = -.018 (N = 25)	p = .932	r = .010 (N = 25)	p = .964	r = -.096 (N = 25)	p = .646
Average changes in *adaptation to change* scores	r = .088 (N = 25)	p = .677	r = .054 (N = 25)	p = .799	r = .085 (N = 25)	p = .686	r = .050 (N = 25)	p = .811	r = .244 (N = 25)	p = .240
Number of mastered targets	r = .813 (N = 25)	p < .001*	r = .856 (N = 25)	p < .001*	r = .830 (N = 25)	p < .001*	r = .869 (N = 25)	p < .001*	r = -.145 (N = 25)	p = .490

	r	p	r	p	r	p	r	p	r	p
Number of introduced programmes	r = .554 (N = 25)	p = .004*	r = .534 (N = 25)	p = .006*	r = .572 (N = 25)	p = .003*	r = .548 (N = 25)	p = .005*	r = -.074 (N = 25)	p = .726
Self-reported self-efficacy scores pre-training	r = -.030 (N = 16)	p = .913	r = -.066 N = 16)	p = .808	r = -.043 N = 16)	p = .875	r = -.073 N = 16)	p = .789	r = -.164 N = 16)	p = .544
Self-reported self-efficacy scores post-training	r = -.131 (N = 16)	p = .628	r = -.119 N = 16)	p = .661	r = -.149 N = 16)	p = .583	r = -.137 N = 16)	p = .613	r = -.271 N = 16)	p = .311
Self-reported self-efficacy scores post-implementation	r = -.187 (N = 15)	p = .504	r = -.314 (N = 15)	p = .254	r = -.138 (N = 15)	p = .624	r = -.268 (N = 15)	p = .333	r = .212 (N = 15)	p = .448
Average changes between pre-training and post-training self-efficacy scores	r = -.024 (N = 16)	p = .929	r = .016 (N = 16)	p = .952	r = -.019 (N = 16)	p = .945	r = .016 (N = 16)	p = .954	r = .050 (N = 16)	p = .853
Observed self-efficacy scores pre-implementation	r = .353 (N = 25)	p = .083	r = .347	p = .090	r = .348	p = .088	r = .349	p = .087	r = -.237	p = .253
Observed self-efficacy scores post-implementation	r = .303 (N = 25)	p = .107	r = .336 (N = 25)	p = .100	r = .331 (N = 25)	p = .107	r = .340 (N = 25)	p = .097	r = -.272 (N = 25)	p = .189

Average changes between pre-implementation and post-implementation observed instructional efficacy scores	r = .014 (N = 25)	p = .947	r = .027 (N = 25)	p = .897	r = .020 (N = 25)	p = .926	r = .029 (N = 25)	p = .891	r = -.063 (N = 25)	p = .765

Figure 15. Diagram of correlational analysis between measures of frequency of intervention delivery and student and parent outcomes.
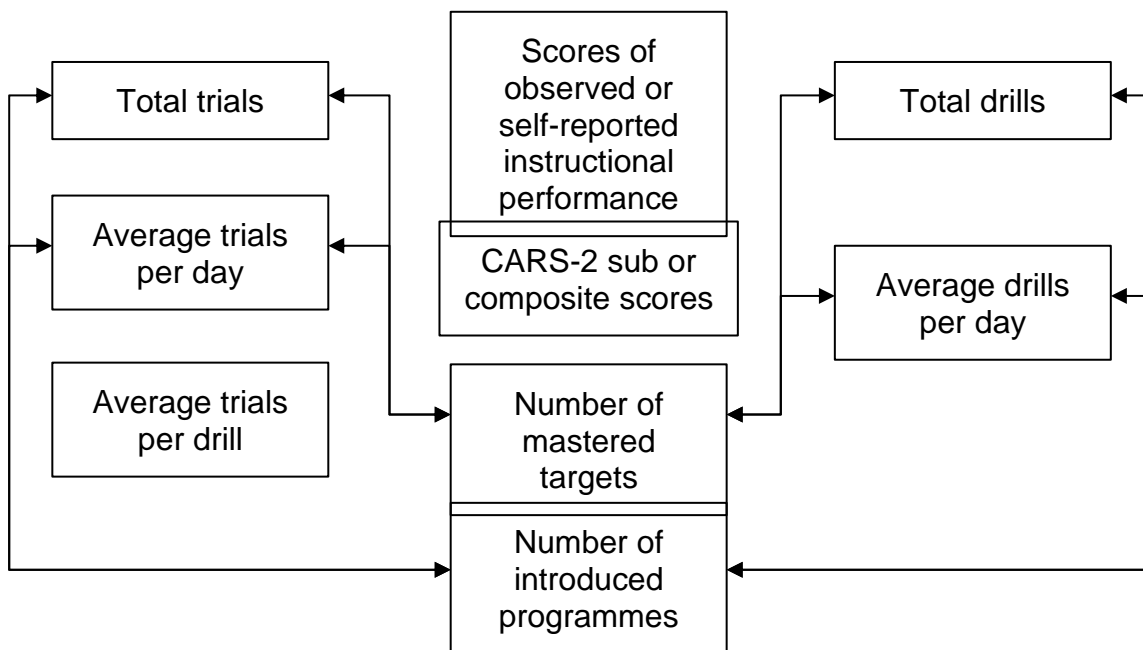
9. Were there evident relationships between parent and student outcome measures?

As illustrated in (Figure 15) there were limited relationships detected between student and parent outcomes. Scores of observed instructional efficacy were not related to those of self-reported efficacy, nor did they exhibit significant correlations to CARS-2 scores, targets mastered or programmes introduced. The only detected correlation was positive and between parent self-reported efficacy scores from the post-training condition and scores from item six in both administrations the CARS-2, however not between the average difference between these scores which as described was found statistically significant. While limited, this lended additional support to evidence of parents of students with most severe symptoms—in this case resistance to change—to exhibit higher rated engagement such as increased scores of self-reported efficacy.

10. Were there relationships between parent instructional self-efficacy scores and scores from the NGSE?

The results of the analysis of the New General Self-Efficacy Scale (NGSE) and the scores from the parent questionnaire of self-efficacy revealed some interesting findings. Paired t-test analysis of mean differences between scores from the pre-implementation and post-implementation conditions did not reveal statistically significant differences between composite or subitem scores of the NGSE. However, bivariate correlational analysis found the composite scores from the first and second administrations of the GSE to be significantly positively correlated. Additionally, there were significant correlations between most subitems before and after implementation.

With regard to the relationship between scores from the parent questionnaire of self-efficacy and scores from the NGSE, there were some noteworthy findings. The analysis did not reveal significant correlations between composite scores from the NGSE and composite scores of instructional efficacy from the parent questionnaire (subitems 2, 5, 6, 16, 17, and 18). However, there were a number of significant correlations between items 17 and 18 from the first and second administration of the parent questionnaire and scores from the first and second administration of the NGSE. Furthermore, scores from items 17 and 18 from the first administration of the parent questionnaire did not correlate with any scores from the second administration of the NGSE, and vice versa. These results suggest that the parent questionnaire of self-efficacy may have some validity in measuring specific areas of knowledge such as behaviour modification strategies, language-based interventions, play-based interventions, and academic interventions. However, more research is needed to further explore the relationship between scores from instruments such as the NGSE and parent questionnaires of self-efficacy to fully understand the usefulness of parent

questionnaires of self-efficacy as a measure of effective and consistent intervention.

11. Which aspects of the SEC-ETP Project should remain or change according to the views of parent participants?

Table 11 outlines the four overarching themes, as well as the subthemes which support each of these themes.

Table 11. Themes, subthemes and the number of key statements consistent with each subtheme.

Theme	Subthemes
Aspects of the SEC-ETP Project valued by parents	Training format and delivery
	Training content
	Intervention design and implementation
	Use of technology
	Student outcomes
Parent general views on the SEC-ETP Project	Training and implementation
	Parent satisfaction
Aspects of the SEC-ETP Project in need of further attention	Use of technology
	Lack of progress in specific areas
	Participation by educators
	Need for continued guidance and support
	Pandemic-related issues

As outlined in the previous chapter, statements while read, were screened for manifest content related to developed codes, themes, or subthemes, such as in the following example where a parent explicitly mentions their satisfaction with practical exercises during theoretical training sessions:

> *"I thought the course was well managed, including the practical exercises used in*
>
> *order to understand the course" (14).*

There were also some cases in which statements were interpreted through their latent meaning. This is illustrated in the following statement, where a parent alludes to the importance of a team-based approach, in this case by mentioning the importance of information sharing. In this case, this statement was coded under the category of team-based approach. They did this in the context of elaborating on their satisfaction with the use of the software platform for data collection:

> *"...having the same information to avoid variation in aspects which could be*
>
> *important" (22).*

In this case, this statement was coded under the category of team-based approach.

Theme one: Aspects of training and intervention valued by parents

This theme emerged from 57 statements by 21 parents; subthemes under this theme included Training format and delivery, Training content, Intervention design and implementation, Use of technology, and Student outcomes. This theme is relevant as it can provide insight into aspects of training and intervention beyond those reported by parents considered as in need of further attention.

The subtheme Training format and delivery emerged from five statements by four parent participants; it highlighted the issues of parent training, educator training and aspects related to

theoretical training delivery format and use of materials. In regards to parent training, one parent explicitly regarded their own ability to deliver interventions in the home as important:

"*The most important aspect was acquiring tools to work in therapy with my*

daughter" (14).

Educator training was highlighted by two parents in the context of delivering interventions with a team-based approach. In the following example, a parent elaborates on this issue when describing the SEC-ETP Project:

"It includes teachers, principals, parents, all of the environment of our child and

not only support in the home but also at his school" (21).

As far as training delivery and materials, two parents pointed to aspects of the training phase of the SEC-ETP Project such as the use of materials and practical examples:

"Workshops went well with the materials necessary to practise and use of clear

examples" (14).

The subtheme Training content emerged from 19 statements by eight parent participants, and highlighted specific areas of knowledge covered during training. Such areas included behaviour modification strategies, language–based, play-based, and academic intervention. Five parents referred to behaviour modification, as in the following example where the parent referred to learning about behaviour modifications in a general sense:

"Having tools to modify the child's behaviour" (18).

From these mentions, four parents reported amelioration of specific disruptive behaviour patterns such as in the following example:

"He controls himself much more when he is angry as for a long time now he has

not bitten, pinched or hit" (2).

Language-based interventions were referred to by statements by six parents, from which, with some parents referred to specific language content areas:

"Reading comprehension, verbs, conjugations, conversations" (17).

These interventions were also mentioned by four parents in the context of the using these interventions to teach functional communication, as in the following example:

"The technique for language, to help my child to communicate" (10).

Support for this was found in statements by three parents which reported communication-related gains, such as in the following example where a parent cites these gains as the rationale for reporting general progress as part of their answer to the first question:

"Because my son has acquired much language, now he is able to say short

phrases to communicate what he wants and does not want" (2).

Five parents referred to the use of play-based interventions, with one parent commenting on the specific use of circles of interaction:

"With the methods by ETP children worked better without getting bored by

repeating the same action, here they played for a moment and worked for a

moment, I think they liked that more than repeating the same thing 10 or 15

times" (11).

Statement from two parents provided further support for inclusion of play-based interventions, with one parent reporting gains in play-related skills:

"He has started to spontaneously play with other children and other toys" (2).

Complemented with the statement by the second parent further highlighting enjoyment of interventions by students:

"My children have fun and learn at the same time" (16).

The inclusion of academic content in students' individualised plans was mentioned by three parents, mostly in the context of other interventions such as in the following example:

"Technique for language, helping my son communicate, teach reading, maths

and behaviour" (10).

Support for the inclusion of academic interventions was offered by statements from two parents, who referred to acquisition of academic material in the context of their satisfaction with the project. In the following example a parent regards to academic progress in a general sense:

"Because he progressed behaviourally and academically" (19).

The subtheme Intervention design and implementation emerged from 14 key statements by nine parent participants. This subtheme highlighted the individualised nature of intervention design and implementation, the use of a team-based approach, as well as the use of specialised guidance and support sessions. Individualised development and implementation of intervention plans was mentioned in statements by five parents as highlighted in the following example:

"Because learning about these topics each student can be managed individually

according to their needs" (14).

Concerning the use of a team-based approach, six parents regarded this as an effective aspect of the Project:

"Working in concert with the school, with parents and this system I think is very

effective in supporting children with ASD" (6).

The use of specialised guidance and support in order to deliver interventions was mentioned by three parents. In the following example, a parent relates this support as an enabler for delivery of interventions in the home:

"By having a constantly accessible communication, it is easier to implement

Programmes" (7).

The subtheme <u>Use of technology</u> included statements by three parents, two of which referred to the use of telehealth as an adequate alternative to in-person guidance and support sessions as in the following example:

"I am very interested to return to a live format, but I am grateful for the effort by

using zoom as this helped significantly" (10).

Some support was offered by parents who qualified guidance and supervision such as in the following statement:

"Very satisfied with the support from the instructor because with much patience

he supports us in working at home through video calls" (21.)

As far as the use of a software platform for data collection purposes, only one parent referred positively to this platform:

"To see in one app the same student information, as sometimes time is lost in so

much paperwork" (22).

Furthermore, statements by four parents expressed limitations imposed by the use of technology, with three of these parents referring to preference for in-person guidance and support sessions:

"I think everything was good even though I would have preferred it to be

in-person" (19).

Additionally, one parent expressed barriers in the use of the software platform:

"I can't see some of the words and this app needs to be available for the

Computer" (3).

The subtheme <u>Student outcomes</u> emerged from 16 statements by 12 parent participants. This theme included statements which highlighted the previously mentioned gains in

communication skills, behavioural functioning, play-related skills, and acquisition of academic concepts. Additionally, progress in general was mentioned by five parents as illustrated by the following statement:

"Because my son had a very satisfactory change with this programme" (13).

Theme two: Parent perspectives on the SEC-ETP Project

This theme emerged from 24 statements by 16 parent participants. Subthemes included Training and implementation and General satisfaction. This theme differs from the previous one in that it relates to perceptions by parents of specific and aspects of the Project in general.

The subtheme Training and implementation emerged from five statements by four parent participants. Aspects in this subtheme included theoretical training and interventions. In the following example a parent refers broadly the theoretical training as an important aspect:

"The six units it appears to me include important aspects regarding areas of

efficacious development of children with autism" (18).

In the following example, a parent referred specifically to their perceived contribution by interventions:

"Every exercise contributed a grain of sand so the child could advance through

this positive impact" (17).

The subtheme Parent satisfaction emerged from 19 statements by 16 parent participants. This includes statements by 12 parents who expressed general satisfaction with the Project. This included seven parents who regarded all aspects as effective, three who expressed that none were ineffective, and two who expressed satisfaction in general. In the following example a parent regards all aspects of the Project as effective:

"All aspects in the case of my daughter were very effective" (4).

The following example is a statement where a parent reported no aspects as ineffective in a general sense:

"None, as all are of great importance and very helpful" (2).

In the following example, a parent reports satisfaction with the Project as a whole:

"Everything was excellent, from the information we were given in different

sessions of the course to the way of working through virtual therapies at home

with the children" (11).

Finally, there were comments by four parents who expressed inability to assess or otherwise provide an assessment of their perception of the Project. Most of these parents did so as they cited pandemic-related difficulties in making a fair assessment of the Project, such as in the following example where a parent responds when asked about ineffective aspects of the Project:

"It is hard to know as the pandemic made it so everything functioned or was

adapted differently." (5).

Theme three: Aspects of the SEC-ETP Project in need of attention

This theme emerged mostly from 13 statements by 13 parent participants, mostly from answers to the third and fourth items in the questionnaire. In addition to the previously mentioned statements regarding Limitations of technology, subthemes also included Lack of progress in specific areas, Participation by educators, Need for continued guidance and support, and Pandemic-related issues.

The subtheme Lack of progress in specific areas included statements by two parents, such as the following where a parent describes slow progress in toilet training routines:

"Only in toilet training we are somewhat stuck, we are moving slow with our girl

but we are doing well" (11).

The subtheme <u>Participation by educators</u> identified as statements by two parents expressed concern for the insufficient participation of educators during the implementation phase of the Project. This is illustrated in the following example:

"Involve school more with therapies, that they also attend zoom sessions" (15).

This was further supported by a parent who reported insufficient contact with teachers as an ineffective aspect of the Project, included an explanation of this in the answer to the fourth item in the questionnaire:

"All teachers should have this kind of training, as they do not know how to treat

children with different conditions than neurotypical children, they need empathy,

from the principal to the teacher, regular education teacher and even the physical

education teacher" (6).

The subtheme <u>Continued guidance and support</u> emerged from statements by three parents, which highlighted a concern for continued provision of guidance and support sessions beyond the Project's duration:

"Continuation with the project is needed and that they keep helping and providing

parents with tools" (14).

In the following example, a parent refers to the frequency and length of sessions:

"The frequency or length of the sessions should be increased" (9).

The subtheme <u>Pandemic-related issues</u> emerged as parents cited difficulties in delivering interventions as a result of health-related contingencies and lockdowns, such as in the following statement:

"The pandemic limited our ability to use all the training we were given" (21).

As described, this subtheme also included statements by two parents who cited difficulty providing an assessment of aspects of the Project.

Discussion

The findings of this mixed-methods study have several implications for future research on the delivery of interventions for children with autism spectrum disorder (ASD) in the home setting. They also hold several implications for future research on interventions for children with autism spectrum disorder (ASD) at home, aligning with the National Standards Project's (NSP) emphasis on evidence-based practices. Primarily, there's a call for highly controlled research to deepen our understanding of the links between various parent and student factors and their outcomes. This echoes the NSP's focus on promoting interventions backed by robust empirical evidence. First, highly controlled research is needed to further learn about relationships between parent and student factors and outcomes. The use of a control group in future studies could help to confirm or discard potential cause-effect relationships, and with ethical and adequate randomisation and allocation strategies (e.g., the use of a waitlist control). Second, results in self-reported measures of instructional efficacy from pre to post-training suggest further evaluation of the parent questionnaire of self-efficacy, and the potential for the use of some of its subitems. However, it would be important to determine whether the implementation period facilitated this retention by comparing post-implementation scores between parents who underwent implementation and those who did not. Unfortunately, this information was not available in this study as parents who did not participate in the implementation phase did not complete measures of self-reported or otherwise instructional efficacy.

Third, it is important to consider other methodological limitations of this study and the outcome measures used in the Project considering the analysis of the obtained evidence. For

example, the limited tools for analysis of quantitative outcomes in this study are limited to within-group correlational analysis and paired comparisons. Therefore, future research should consider using different tools for analysis to provide a more comprehensive understanding of the results.

Finally, it is important to note that the amount of supervision was positively associated with measures of overall intervention frequency, but it was not associated with the average number of trials per drill. This suggests that while supervision is important, other factors such as specific aspects of the intervention, the child's ability to adapt to changes, and the parent's self-perceived proficiency may also play a role in the frequency of delivered interventions.

Overall, these findings highlight the importance of addressing the specific needs and concerns of families, addressing these issues during the implementation phase of similar programmes, and considering the challenges caused by the pandemic when planning future research.

Limitations

Parent participants in this study are a subset from the participants subject of study I, therefore also subject to the limitations that come from voluntary recruitment and geographical area, which may have provided participants more primed and inclined to engage with the proposed interventions, as well as from a limited cultural subset of the Mexican population. These limitations extend to student participants in this study, as they are children of the included parent participants. Additionally, there are no follow-up measures for parent and student outcomes, which are needed to assess the extent to which parent and student outcomes were maintained beyond the scope of the Project.

Finally, and importantly, the tools for analysis of quantitative outcomes in this study are limited to within-group correlational analysis and paired comparisons. Between-groups, well-controlled, randomised trials would be needed to confirm the presence of relationships identified in this study, and possibly identify unidirectional, cause-effect relationships between factors relevant to implementation within and outside the scope of this study. This would be in line with the NSP's emphasis on ethical randomisation and allocation strategies, like a waitlist control, for more effective assessment of intervention impacts.

Clinical Implications

Implications from the findings in this study include those relevant to guiding and supporting parents to deliver interventions in the home setting. They are here categorised as those relevant to the scaffolding process during early stages in intervention, those related to specific aspects of intervention, as well as implications on the justification of use of parent-delivered, home-based programmes to provide ASD interventions.

The relationship between supervision hours and frequency of recorded interventions seems to provide some specialised guidance as support for parents as they learn to deliver interventions in the home setting, as frequency of recorded interventions in turn was associated with more mastered targets and introduced programmes. However, it is also important to consider that relative to the therapeutic demands of an *intensive* intervention programme, parents in this study recorded interventions at a low rate, and that the implementation phase of the Project took place within the constraints and with the added complexities of lockdown protocols in Mexico derived from a global pandemic. Research as suggested in the section below could provide for programmes with more robust implementation data under more typical circumstances to evaluate the generalisability of results in this study. Additionally, the use of technology at the

time of implementation presented challenges which included occasional unavailability of equipment to record interventions, or difficulties with internet access as families delivered interventions in their home. Even though technologies continue evolving, such barriers should be considered when encouraging and enabling families to provide interventions in their home.

As far as delivery of interventions, findings suggest that a technology-aided, multi-dimensional analysis frequency of delivered interventions can provide differentiated signs of progress. In this study this is exemplified by identification of potential relationships between different aspects of frequency and student-related measures. It is noteworthy that even though the amount of supervision was positively associated with measures of overall intervention frequency—in this case number of total recorded trials—, it was not associated with the average number of trials per drill, and of further interest that higher numbers of average trials per drill were associated with higher pre-implementation composite ASD severity scores. This suggests that more severe symptoms of ASD were associated with longer trials. However, it is more likely that students with lesser ability to adapt to changes could be less able to complete and sustain longer drills. This could suggest the influence of external factor(s) within (e.g., the training and supervision provided) or outside the scope of this study which counteracted an expected association between more severe symptoms and shorter attention periods.

Finally, these findings provide some support for clinicians and families to undertake collaborative intervention programmes, with parents as primary interventionists and clinicians as providers of guidance and support. While attendance to more training hours was associated with higher levels of observed instructional efficacy, it was the children with higher—more severe—*adaptation to change* scores whose parents were more likely to rate higher on self-efficacy after training, suggesting that those parents with children with more severe impairment considered

themselves the most able to deliver interventions. This would be consistent with the likelihood that a parent who engages with more severe symptomatology would become more proficient in doing so, and the larger increases in educator self-efficacy in comparison to parent-self-efficacy discussed in study I. Notably, a positive correlation was detected between the number of total drills, trials, average trials per day, average drills per day and the percentage of delivered trials which took place on Saturdays and Sundays, with average trials per drill as the exception. While most recorded interventions took place during the week, recorded engagement on weekends —as it was not essential for participation in the Project— provides further support for the enabling of parents to deliver interventions independently.

Research Implications

Implications of these results on future research include the need for highly controlled research to further identify relationships between parent and student factors and outcomes; it also includes the consideration of other methodological limitations of this study and the outcome measures used in the *Project* considering the analysis of the obtained evidence.

Analysis in the context of scores from the NGSE bring attention to items 17 and 18 of the parent self-efficacy questionnaire as potential candidates for measurement of levels of self-reported efficacy in delivering interventions. While post-implementation self-reported efficacy scores did not improve in comparison to scores from post-training conditions, they remained significantly higher than those from pre-training conditions, signalling maintenance of at least self-perceived levels of instructional efficacy. To determine whether the implementation period facilitated this retention, post-implementation scores would have to be compared between parents who underwent implementation and those who did not. However, this information was

not available as parents who did not participate in the implementation phase did not complete measures of self-reported or otherwise instructional efficacy.

This could also mean that an acceptable level of self-reported proficiency can be reached with theoretical training, and that such training may be helpful but not as instrumental to the frequency of interventions delivered, but that instead it was other factors such as the amount of supervision which are associated with the frequency of delivered interventions. In order to make this determination additional research could provide gaps in outcome data (e.g., instructional performance scores from pre-training phase), and by design—by comparing results against those of a control condition group—, controlled research can help confirm or discard potential cause-effect relationships between parent and student factors and outcomes subject of this study.

Conclusions

In conclusion, the study's implications highlight the importance of addressing family-specific needs during the implementation phase, aligning with the NSP's goal of tailoring interventions to individual contexts. The study's call for further research in more typical circumstances to evaluate generalisability also resonates with the NSP's emphasis on ensuring interventions' applicability across diverse settings. Overall, these findings reinforce the NSP's approach of advocating for evidence-based practices supported by rigorous research and comprehensive evaluations. Findings suggest the potential for theoretical and practical training programmes for home-based delivery of interventions by parents of students diagnosed with ASD. Distal measures of outcome —severity of ASD impairments— did not reflect overall statistical change in severity from pre- to post-implementation, except for the *adaptation to change* sub score. As far as parents' ability to deliver interventions, there were significant changes in levels of observed instructional efficacy, however not in self-reported instructional efficacy during this period. A multidimensional view of intervention frequency allowed

identification of potentially important areas in need of attention in the context of clinical

practice. As far as future research, this study further supports the development of implementation

designs which allow for research within paradigms of optimal control, by using mechanisms

such as early identification of participants and waitlist controls to adequately assess the effects of

interventions such as those subject of this work on relevant parent and student outcomes.

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Chapter 6

Implications of this research on clinical practice and future research

This chapter aims to explore the clinical and research-based implications of the findings presented throughout this thesis. The implications are derived from a synthesis of the research studies, literature review and the analysis of data collected by the *Secretaría de Educación y Cultura* [Secretariat of Education and Culture] and *Explora tu Potential A.C.* [Explore your Potential A.C.] Project (SEC-ETP) to examine the outcomes of training and interventions delivered to students diagnosed with Autism Spectrum Disorder (ASD) enrolled in public schools across the state of Sonora in Mexico, as well as their parents and educators. The aim is to provide insights on how the findings of this research can be applied in the development of future educational efforts to help parents and educators deliver effective interventions to students diagnosed with ASD.

Clinical Implications

The review of literature suggests that parent and educator-delivered interventions for school-age children with autism are understudied in comparison to interventions conducted by specialists or in clinical settings. This highlights the need for more clinical research in this area to better understand the types of interventions that are most appropriate for individual children/students and how to effectively train parents and educators to deliver these interventions in home and school settings, consistent with the NSP's emphasis on evidence-based practices and the need for comprehensive research in intervention delivery. The studies reviewed mostly yielded naturalistic interventions, with a tendency towards ABA-based or NDBI-based interventions in home and school settings. This raises questions about whether these interventions are selected because they can be easier for parents and educators to embed play-

based interventions within existing routines, because they can be perceived as more palatable

than ABA-based interventions, or because they have indeed been shown to be the most

appropriate intervention for individual children/students. The operational descriptions of

interventions and outcomes in these studies were consistent with their philosophical frameworks,

but there were significant areas of overlap regarding their practical implementation. This has

implications for how these interventions are approached during parent and educator training

practices, in alignment with NSP's advocacy for understanding the practical implementation of

interventions during training. The findings of the studies suggest that both positive and negative

child/student-related outcomes were detected by distal outcome measures such as ASD severity

and social communication skills, as well as by measures of proximal and high-order language

skills. The positive outcomes related to parents and educators outnumbered the negative ones,

corresponding to the NSP's emphasis on considering both child/student outcomes and those of

parents and educators. The risk-of-bias assessment included in chapter two suggests potential

conflicts of interest on behalf of the main researcher due to personal, professional, and financial

stake in the success of programs that deliver ABA and play and speech-language-based

interventions. This could potentially lead to confirmation bias influencing the design of the

implementation model in the SEC-ETP Project. Therefore, it is important to consider the

limitations of these choices when evaluating the adequacy of the measures selected for the study

of training and intervention effectiveness, consistent with the NSP's standards in evaluating

potential biases and conflicts of interest. The research highlights the importance of considering

the influence of pandemic-related issues when assessing the quality of interventions and their

effectiveness. The findings suggest that the pandemic may have made it difficult for parents to

provide an objective assessment of the interventions and the project, which may have

implications for the generalisation of results, acknowledging external factors, such as pandemics, that can impact the evaluation of interventions, a notion consistent with NSP's encouragement to consider external influences. Overall, the research suggests that parent and educator-delivered interventions for school-age children with autism are an understudied area and more research is needed to better understand the types of interventions that are most appropriate for individual children/students and how to effectively train parents and educators to deliver these interventions in home and school settings. The research also highlights the importance of considering the influence of factors such as bias, pandemic-related issues, and multiple outcomes when evaluating the effectiveness of interventions, aligning with NSP's focus on thorough research and consideration of various factors in evaluating intervention effectiveness.

Research Implications

Further research is needed to investigate the effectiveness of parent and educator-delivered interventions for school-age children with autism spectrum disorder. The current body of research is relatively small, and more studies are needed to explore the types of interventions that are most appropriate for individual children/students and how to effectively train parents and educators to deliver these interventions in home and school settings, supporting NSP's emphasis on the need for more comprehensive research in intervention delivery. Additionally, more research is needed to understand the factors that influence the effectiveness of these interventions. This includes investigating the impact of different intervention models, such as ABA-based and NDBI-based interventions, as well as the impact of different training methods, such as in-person and teleconference training, consistent with NSP's encouragement for varied investigation into intervention models and training methods. Moreover, more research is needed to understand the long-term outcomes of these interventions, including how well the skills

acquired through the interventions are maintained over time and the impact of the interventions on the overall quality of life for children with ASD and their families, reflecting NSP's emphasis on assessing long-term outcomes and the impact on the quality of life. Additionally, more research is needed to understand the cultural and contextual factors that may influence the effectiveness of these interventions in different settings, cultures, and contexts. This includes understanding how cultural norms, values, and beliefs may influence the implementation and outcomes of parent and educator-delivered interventions for school-age children with autism, acknowledging the importance of cultural and contextual factors in line with NSP's emphasis on understanding interventions in diverse settings. It is also important to consider the potential biases that may affect the results of these studies. This includes the potential conflict of interest that the author may have due to personal and professional investment in the success of the interventions and the potential impact of pandemic-related issues on the quality and effectiveness of the interventions, aligning with NSP's standards in evaluating potential biases and conflicts of interest. In conclusion, this thesis highlights the need for further research on parent and educator-delivered interventions for school-age children with ASD. The findings suggest that NDBIs or ABA-based interventions complemented by NDBIs may be more appropriate in home and school settings and that there is a need for further research on the effectiveness of these interventions and the best methods for delivering them to parents and educators. Additionally, more research is needed to understand the limitations of these interventions and the potential biases that may have affected the results of the studies, as well as the cultural and contextual factors that may influence the effectiveness of these interventions, echoing the NSP's advocacy for continued research and thorough understanding of intervention limitations and contextual influences.

APPENDICES

APPENDIX A

Summarised list of studies on parent-delivered interventions included in the literature review part of this work (Chapter 2).

Authors and year of publication	Group size Mean age(SD) Range Males/females	Intervention	Tools for Statistical Analysis	Child measures and outcomes	Parent/educator measures and outcomes
Hampton, L. H., Kaiser, A. P., & Fuller, E. A. (2020)	Sample size; 68 Mean age: 43 36-57 months 53 males/15 females	Parent-delivered DTT + JASPER + EMT + SGD intervention Thirtyfive 45-60 min sessions within a 4-month period (two in a clinical setting and one at home per week) with a waitlist control group. waitlist	t-tests and chi-square tests	**Coded 10-minute video of parent-child interaction.** Significant effects of interventions were noted on levels of joint attention. **Scores from the PLS-5.** No significant changes in language scores **Systematic Analysis of Language Transcripts (SALT) (MIller and Chapman (2008) of a naturalistic language sample.** Frequency of social communicative utterances did not evidence significant effect from intervention.	**Coded 10-minute video of parent-child interaction.** Trained parents used significantly more JASPER-related strategies than those in the control group. **20-item survey at post-intervention** Parents rated high levels of satisfaction with target interventions and coaching procedures.

Hardan, A. Y., Gengoux, G. W., Berquist, K. L., Libove, R. A., Ardel, C. M., Phillips, J., Frazier, T. W., & Minjarez, M. B. (2015)	Sample size; 48 Mean age: 43 36-57 months 36 males/12 females	Pivotal Response teaching (PRT) Eight 90-minute parent training sessions over a 12-week period. Four 60-minute sessions with each parent-child dyad Psychoeducation control group	Mixed effects regression model	**CGI subscale scores of *Improvement and severity of social communication.*** Significant intervention effects on score of severity of social communication. **Structured laboratory observation.** Significant effect on total utterances produced. **Vineland Adaptive Behavior Scales-II** Significant changes in scores from the *communication* subscale (receptive and expressive raw scores).. **PLS-4 expressive language standard scores.** There were no significant treatment effects on	**Structured laboratory observation.** Fidelity of parent-delivered PRT interventions for the intervention were acceptable and significantly higher than fidelity ratings from the comparison group.

				expressive language scores. **Words and Gestures and Words and Sentences versions of The MacArthur-Bates Communicative Development Inventories (CDI; Fenson et al., 2007)** No effect on the number of words used. **Social Responsiveness Scale (SRS;** Constantino & Gruber, 2005) No effects on scores of social responsiveness.	
Lindgren, S., Wacker, D., Schieltz, K., Suess, A., Pelzel, K., Kopelman, T., Lee, J., Romani, P., & O'Brien, M.	Sample size; 38 Mean age: 52 29-84 months 32 males/6 females	Functional Communication Training (FCT) Average of 9 weekly visits (3-20 weeks) TAU (12 weeks) 2-3 5-minute monthly sessions	Linear mixed model for repeated measures	**Analysis of video recording of parent-child interaction** Effect from intervention was evident in significantly higher functional requests, and less frequency of problem behaviours after intervention.	**Treatment Acceptability Rating Form-Revised (TARF-R; Reimers et al. 1991)** High rates of acceptability were reported by parents in both groups.

(2020)					
Mahoney, G., & Solomon, R. (2016)	Sample size; 112 Mean age: 50 32-71 months 94 males/18 females	PLAY Project Home Consultation Programme Monthly 3-hour visits for 1 year community standard (CS) treatment	Multivariate analysis of variance (MANOVA)	**Autism Diagnostic Observation Schedule (ADOS) (Lord et al. 2000)** Significant effects were not evident for repetitive and restrictive behaviour (RRB) scores or for the total ADOS calibrated severity scores (CSS) scores. Significant intervention effects were evident on social affect (SA) scores from the ADOS. **Social Communication Questionnaire (SCQ) (Rutter et al. 2003)** Significant effect of PLAY on the severity of children's SA disorders, **Child Behaviour Rating Scale (CBRS) (Mahoney and Wheeden, 1999)** Significant effect on the 'responsive' and 'affect' scales **Functional Emotional Assessment Scale (FEAS; Greenspan et al. 2001)** Moderate effect on measures	**Maternal Behaviour Rating Scale (MBRS) (Mahoney 2008)** Large effect of treatment on responsive/affect (B = 1.01 (.16), p = .000)

				of functional development (B = 6.11 (2.25), p = .008).	
Manohar, H., Kandasamy, P., Chandrasekaran, V., & Rajkumar, R. P. (2019)	Sample size; 50 Mean age: 41 2-6 years 42 males/8 females	Naturalistic developmental behavioural interventions(NDBIs) Twelve weeks of brief parent-mediated intervention in addition to Treatment as usual (TAU)	Repeated measures two-way Analysis of Variance (RM-ANOVA)	**Childhood Autism Rating Scale (CARS; (Schopler et al. 1980)** Significant treatment effects on composite scores (F = 9.733, p = 0.001, ES η2= 0.169) Statistically significant improvements in scores of the subscales relating *to people, imitation skills, visual response, listening response,* and *non-verbal communication.*	**Family interview for stress and coping (FISC) (Girimaji et al. 1999)** Significant positive effects in perceived stress (F = 3.728, p = 0.026*, ES = 0.072) Significant positive effects in use of coping strategies (F = 9.508, p = 0.001*, ES = 0.165)
Rogers, S. J., Estes, A., Lord, C., Vismara, L., Winter, J., Fitzpatrick, A., Guo, M., & Dawson,	Sample size; 98 Mean age: 21 moths 76 males/15 females	Early Start Denver Project (P-ESDM) Twelve weeks, one weekly hour of contact.	Linear regression models	**Autism Diagnostic Observation Scale for Toddlers (ADOS-T)** No significant effects of treatment on standardised measures of early development, receptive and expressive language, or ADOS severity scores were evidenced.	**Working Alliance Scale for Interventions with Children.** Treatment effect was detected on parent ratings of their working alliances with therapists. **ESDM Parent Fidelity Tool (Rogers, Dawson, Vismara, 2012)** Both groups of parents evidenced significant increase in use of ESDM strategies, however the difference between groups was not significant.

G. (2012)					
Solomon, R., Van Egeren, L.,A., Mahoney, G., Quon Huber, M.,S., & Zimmerman, P. (2014)	Sample size; 85 Mean age: 32 months 105 males/23 females	PLAY Project Home Consultation Programme Monthly 3-hour visits for 1 year community standard (CS) treatment	Repeated measure analysis of covariance and multivariate analysis of covariance (MANCOVA)	**Autism Diagnostic Observation Schedule (ADOS)** Children in the intervention group were more likely to be adjudicated a category of less severity on the ADOS-G after intervention. **Mullen Scales of Early learning (MSEL) (Mullen1995) Words and Gestures and Words and Sentences versions of The MacArthur-Bates Communicative Development Inventories (CDI) (Fenson2007)** No treatment effects were evidenced by standardised testing of developmental skills, receptive or expressive language. **Social Communication Questionnaire (SCQ) (Rutter et al. 2003)** Significant effect of PLAY on the severity of children's SA disorders,	**The Parenting Stress Index (PSI)(Abidin 1995)** No treatment effects were noted for levels of parental stress. **Center for Epidemiologic Studies Depression Scale (CES-D; Radloff1977)** Parents less likely to be classified as 'depressed' (Wald estimate = 4.64, p = .031*; Exp(B) = 3.02; 95% CI, 1.11–8.250) **Maternal Behaviour Rating Scale (MBRS) (Mahoney 2008)** Large effect of treatment on responsiveness, affect, achievement orientation and directive (B = 1.01 (.16), p = .000)

				Child Behaviour Rating Scale (CBRS) (Mahoney and Wheeden, 1999) Attention (F = 8.15*, r = 0.23, η2= 0.07) Initiation (F = 16.67*, r = 0.14, η2= 0.14) **Functional Emotional Assessment Scale (FEAS)** (F = 6.02*, r = 0.23, η2= 0.05)	
Vismara, L. A., McCormick, C. E., Wagner, A. L., Monlux, K., Nadhan, A., & Young, G. S. (2018)	Sample size; 24 Mean age: 30 months 18-48 months 17 males/7 females	Early Start Denver Project (P-ESDM) Twelve weekly 1.5-hour sessions	Linear mixed model approach	**Analysis of video recordings of parent-child interactions** Treatment effects were observed by both groups on levels of imitation (F(1, 64.5) = 4.83, p < .05) However they were not observed for measures of initiated joint attention and spontaneous communication.	**Assessment of data from instances and lengths of site navigation** Parents who underwent ESDM training accessed online resources significantly more than those in the comparison group **20-item likert-type questionnaire** Higher levels of satisfaction with the intervention than control group. **P-ESDM fidelity tool (Rogers and Dawson, 2010)** There was no significant treatment effect on parents' ability to deliver ESDM interventions.

APPENDIX B

Summarised list of studies on educator-delivered interventions included in the literature review part of this work (Chapter 2).

Authors and year of publication	Group size Mean age(SD) Range Males/females	Intervention	Design and Analysis	Student measures and outcomes	Educator measures and outcomes
Engelstad, A., Holingue, C., & Landa, R. J. (2020)	Sample size; 24 Mean age: 47 months 15 males/16 females	For a period of six months within a school year, SLPs coached teachers on the use of NDBI strategies	Linear mixed-effect models	**Analysis of video recordings** Large effect sizes were observed on frequency of initiated joint attention (g = 0.9) and MSEL nonverbal composite (g = 0.9). **Mullen Scales of Early learning (MSEL) (Mullen1995)** A significant treatment effect was detected for the non-verbal (visual reception and fine motor) (g = 0.9) composite scores. Medium effect sizes were detected for spontaneous verbalisations (g = 0.7) and verbal composite (g = 0.5). Small effect size was detected for directed gestures (g = 0.2).	**Analysis of video recordings** Fidelity of trained teachers' delivery of interventions was significantly higher than those in the control group at the seven post-training assessment periods (p < .0001).
Henry, A. R., & Solari, E. J. (2020)	Sample size; 43 Mean age: 80 months 35 males/8 females	Language-based instruction	Two-way mixed ANOVA	**Expressive Vocabulary Test, Second Edition (EVT-2; Williams 2007)** There were significant treatment effects detected on EVT-2 scores of expressive vocabulary. Even though significant increases in vocabulary scores were detected for the intervention group (F(1, 41) = 4.65, p = 0.04), and no significant increases were noted in the control group, no significant differences were detected	**Analysis of video recordings during implementation** Teachers obtained high scores of fidelity of intervention in the beginning of intervention, and moderate-high scores at the end of intervention. **12-item questionnaire of acceptability, appropriateness, and feasibility (Weiner et al. 2017)** Teachers rated feasibility and acceptability of intervention as exceptionally high.

				between intervention and control mean expressive vocabulary scores at post-intervention. **Narrative Memory subtest of the Developmental NEuroPSYchological Assessment, Second Edition (NEPSY-II; Korkman et al. 2007)** Significant treatment effects were detected on positive changes in scores from the NEPSY-II measure of storytelling skills (F(1, 41) = 4.36, p = 0.04). **Clinical Evaluation of Language Fundamentals, 4th Edition (CELF-4; Semel-Mintz et al. 2003)** A significant effect was detected on CELF-4 receptive language scores (F(1, 41) = 7.82, p = 0.01, partial η2 = 0.16)..	
Kaale, Smith, & Sponheim. (2012)	Sample size; 61 Mean age: 27 months 48 males/13 females	JA and JE intervention	Quasi–Poisson model, ANCOVA	**Analysis of video recordings during implementation by application of the Early Social Communication Scale (ESCS; Mundy et al., 2003)** Significant effect of treatment on frequency of joint attention skills during teacher-child play (t (1, 59) = 2.147, p = .036). Significant effect of treatment on frequency of joint engagement during mother-child play (F (1, 59) = 6.271, p = .015).	**Analysis of video recordings during implementation** No apparent effects on levels of preschool teacher initiation of joint attention or mother initiation of joint engagement.
Panganiban	Sample size; 49	JASPER	Chi-square	**Short Play and Communication**	**Analysis of video recordings during**

, J. L., Shire, S. Y., Williams, J., & Kasari, C. (2022)	Mean age: 47 months 2 males/49 females		ANOVA Type III	**Evaluation (SPACE; Shire et al., 2018)** No significant treatment effect on time spent on a joint task was detected. **Mullen Scales of Early learning (MSEL) (Mullen1995)** No significant treatment effect was detected on receptive or expressive language scores. **Early Social-Communication Scales (ESCS; Mundy et al., 1988)** There was no detected significant effect on scores of spontaneous joint attention or spontaneous behaviour regulation.	**implementation** There was a significant effect of intervention on improved use of JASPER strategies detected by educators (F(1,38) = 17.14, p < 0.001).
Wong, C. S. (2013)	Sample size; 33 Mean age: 56 months 29 males/4 females	Joint attention and symbolic play intervention	Hierarchical linear modelling (HLM 7.0; Raudenbush et al., 2011)	**Analysis of classroom observation by application of the Early Social Communication Scale (ESCS; Mundy et al., 2003)** The group which started with joint attention intervention followed by symbolic play intervention evidenced significantly higher scores of joint engagement (b = −9.44, SE = 4.53, p = .06) and frequency of initiated joint attention (b = −0.09, SE = 0.04, p = .03).	**12-item questionnaire of acceptability of interventions** Moderate-high level of acceptability was reported, and percentages of fidelity increased for all classrooms. Children's levels of joint attention evidenced a significant relationship with levels of teacher acceptability and fidelity of intervention.

APPENDIX C

English version of parent questionnaire of self-efficacy.

Select an option for each of the following:	↓									
1. I feel I am an active member in my child 's special education team.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
2. I have received sufficient training about the educational and therapeutic attention my child needs.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
3. The needs of my child are satisfied under his/her education plan.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
4. I understand my child's education plan.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
5. I have the knowledge to exercise play-based interventions that allow me to establish a positive relationship with my child.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
6. I have the knowledge to analyse and modify inappropriate behaviours in my child.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
7. Communication with my child's school and educators is effective.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
8. My child is an accepted and included member of his school community.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
9. I know who to communicate with in my child's school if there is any concern about his/her IEP.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
10. I feel the school personnel are trained to understand the particular needs of my child.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
11. My child is adequately prepared for his/her transition to the next educational level.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree

12. I have directly contacted personnel from the Secretariat of Education and Culture (SEC) with questions or concerns about my child's indivdualised education plan (IEP).	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
13. I have received responses to my communications with school personnel within a reasonable timeframe.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
14. To this day, I have had sufficient support (knowledge, troubleshooting) from SEC to implement my child's education plan.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
15. I believe the educational personnel in SEC is prepared to take in and appropriately treat students with ASD in preschool and primary school levels, as well as to maximise their learning.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
16. I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
17. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain my child's attention and motivation.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
18. I understand the use of Discrete Trial Teaching in relation to specific skills in home and school environments.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree

19. ¿What is your perception of your child's academic programme?	1 I do not see consistent learning and do not understand his individualised educational plan	2 I do not see consistent learning even though I understand my individualised educational plan	3 Progress in some areas but not in most	4 Appropriate with areas for improvement	5 Appropriate with no problems
20. ¿What types of behavioural problems do I see in my home in relation to my child having ASD?	1 Very severe and very frequent	2 Frequent and in need of extraordinary support	3 Few and in need of extraordinary support	4 Occasional but manageable	5 No problems

APPENDIX D

English version of educator questionnaire of self-efficacy.

Select an option for each of the following:	↓									
1. I have received sufficient training for the attention to students diagnosed with autism spectrum disorder (ASD).	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
2. I have sufficient knowledge to create individualised intervention programmes for students with ASD.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
3. I have knowledge to implement individualised intervention programmes for students with ASD.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
4. I have the knowledge to exercise play-based therapy methods that allow me to establish a positive relationship with students with ASD.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
5. I have the knowledge to analyse and shape inappropriate behaviours in students with ASD.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
6. To this day, I have had sufficient support (knowledge, troubleshooting) by the Secretariat of Education and Culture (SEC) for the realisation appropriate education programmes for students with ASD.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
7. I believe SEC's educational personnel is prepared to take in and appropriately treat students with ASD in preschool and primary school levels, as well as to maximise their learning.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
8. I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
9. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain attention and motivation in my students.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
10. I understand the use of Discrete Trial Teaching in relation to specific skills in the academic environment.	1 strongly disagree	2	3	4	5	6	7	8	9	10 strongly agree
11. What types of behavioural problems do I see in my students with ASD?	1	2		3		4		5 No problems		

	Very severe and very frequent	Frequent and in need of extraordinary support	Few and in need of extraordinary support	Occasional but manageable	

APPENDIX E

Results of analysis via two-tailed t-tests of the differences between average scores for each item and for items within specific areas of interest from the *Parent Quality Control Questionnaire* completed by two groups of educator participants before and after the training phase of the SEC-ETP Project.

	In-person training group			Videoconference-format training group		
Question	Mean differences in mean scores between pre and post post-training (M, SE)	T-value	P-value	Mean difference, SD between pre and post post-training parent scores	T-value	p-value
Parent perceptions of self-efficacy (items 2, 4, 5, 6, 16, 17 and 18)						
2. I have received sufficient training about the educational and therapeutic attention my child needs.	M = 1.81 ± .54	t(37) = 3.364	p = .002*	M = 1.00 ± .30	t(19) = 3.343	p = .003*
5. I have the knowledge to exercise play-based interventions that allow me to establish a positive relationship with my child.	M = 1.71 ± .52	t(37) = 3.282	p = .002*	M = 1.30 ± .38	t(19) = 3.442	p = .003*
6. I have the knowledge to analyse and modify inappropriate behaviours in my child.	M = 1.47 ± .57	t(37) = 2.572	p = .014*	M = 1.60 ± .42	t(19) = 3.816	p = .001*
16. I understand specific behavioural modification concepts such as Extinction and	M = 4.08 ± .74	t(37) = 5.538	p < .001*	M = 1.30 ± .36	t(19) = 3.577	p = .002*

Reinforcement, and how I can apply these at home and other environments effectively.						
17. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain my child's attention and motivation.	M = 1.21 ± .84	t(37) = 1.437	p = .159	M = 2.20 ± .46	t(19) = 4.759	p < .001*
18. I understand the use of Discrete Trial Teaching in relation to specific skills in home and school environments.	M = 1.76 ± .84	t(37) = 2.088	p = .044*	M = 2.05 ± .45	t(19) = 4.556	p < .001*
Total parent self-efficacy scores	M = 12.05 ± 2.67	t(37) = 4.51	p < .001*	M = 9.45 ± 1.83	t(19) = 5.139	p < .001*
Parent perceptions of educator instructional efficacy (items 3, 8, 10, 11 and 15)						
3. The needs of my child are satisfied under his/her Individualised education Plan (IEP).	M = .92 ± .61	t(37) = 1.511	p = .139	M = .70 ± .44	t(19) = 1.606	p = .125
8. My child is an accepted and included member of his school community.	M = 1.21 ± .50	t(37) = 2.425	p = .020*	M = -.05 ± .20	t(19) = -.252	p = .804
10. I feel the school personnel are trained to understand the particular needs of my child.	M = .92 ± .55	t(37) = 1.656	p = .106	M = -.05 ± .44	t(19) = -.113	p = .912
11. My child is adequately prepared for his/her transition to the next educational level.	M = .84 ± .53	t(37) = 1.589	p = .121	M = -.60 ± .48	t(19) = -1.241	p = .230
15. I believe the educational personnel in SEC is prepared to take in and appropriately treat students with ASD in preschool and primary	M = .315 ± .59	t(37) = .538	p = .594	M = 1.05 ± .51	t(19) = 2.058	p = .054

school levels, as well as to maximise their learning.						
Total parent perceptions of educators' instructional efficacy scores	M = 3.81 ± 2.06	t(37) = 1.853	p = .072	M = 1.05 ± 1.08	t(19) = .966	p = .346
Parent perceptions of the of the supports and implementation of interventions by SEC (items 1, 4, 7, 9, 12, 13, 14)						
1. I feel I am an active member in my child 's special education team.	M = .11 ± .41	t(37) = .257	p = .798	M = .00 ± .28	t(19) = .000	p = 1
4. I understand my child's education plan.	M = 1.18 ± .63	t(37) = 1.89	p = .067	M = .10 ± .56	t(19) = .177	p = .862
7. Communication with my child's school and educators is effective.	M = .82 ± .40	t(37) = 2.064	p = .046*	M = .10 ± .27	t(19) = .37	p = .716
9. I know who to communicate with in my child's school if there is any concern about his/her IEP.	M = .29 ± .38	t(37) = .760	p = .452	M = -.25 ± .26	t(19) = -.960	p = .349
12. I have directly contacted personnel from the Secretariat of Education and Culture (SEC) with questions or concerns about my child's indivdualised education plan (IEP).	M = .34 ± .73	t(37) = .467	p = .643	M = .00 ± .74	t(19) = .000	p = 1
13. I have received responses to my communications with school personnel within a reasonable timeframe.	M = .76 ± .72	t(37) = 1.056	p = .298	M = -.30 ± .24	t(19) = -1.241	p = .230
14. To this day, I have had sufficient support (knowledge, troubleshooting) from SEC to implement my child's education plan.	M = 1.08 ± .64	t(37) = 1.679	p = .102	M = .65 ± .57	t(19) = 1.145	p = .267

Total scores of parent perceptions of supports provided by SEC	M = 4.58 ± 2.80	t(37) = 1.638	p = .110	M = .30 ± 7.99	t(19) = .168	p = .868
Other						
19. What is your perception of your child's academic programme?	M = .18 ± .32	t(37) = .580	p = .565	M = -.20 ± .26	t(19) = -.777	p = .447
20. What types of behavioural problems do I see in my home in relation to my child having ASD?	M = .24 ± .30	t(37) = .795	p = .432	M = .15 ± .20	t(19) = .767	p = .453

APPENDIX F

Results of analysis via two-tailed t-tests of the differences between average scores for each item and for items within specific areas of interest from the *Educator Quality Control Questionnaire* completed by two groups of educator participants before and after the training phase of the SEC-ETP Project.

	In-person training group			Videoconference-format training group		
Question	Mean difference, SD between pre and post post-training educator scores	t-value	p-value	Mean difference, SD between pre and post post-training educator scores	t-value	p-value
Educator perceptions of their own general knowledge and application of interventions. (items 1, 2, 3, 4, 5, 8, 9 and 10)						
1. I have received sufficient training for the attention to students diagnosed with autism spectrum disorder (ASD).	M = 3.79 ± .33	t(70) = 11.35	p < .001*	M = 3.29 ± .28	t(129) = 11.887	p < .001*
2. I have sufficient knowledge to create individualised intervention programmes for students with ASD.	M = 3.10 ± .38	t(70) = 8.151	p < .001*	M = 2.71 ± .27	t(129) = 10.033	p < .001*

3. I have knowledge to implement individualised intervention programmes for students with ASD.	M = 2.96 ± .39	t(70) = 7.589	p < .001*	M = 2.80 ± .27	t(129) = 10.310	p < .001*
4. I have the knowledge to exercise play-based therapy methods that allow me to establish a positive relationship with students with ASD.	M = 3.00 ± .38	t(70) = 7.817	p < .001*	M = 3.09 ± .27	t(129) = 11.480	p < .001*
5. I have the knowledge to analyse and shape inappropriate behaviours in students with ASD.	M = 3.23 ± .33	t(70) = 9.710	p < .001*	M = 2.82 ± .26	t(129) = 10.848	p < .001*
8. I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively.	M = 2.01 ± .33	t(70) = 6.071	p < .001*	M = 2.18 ± .25	t(129) = 8.699	p < .001*
9. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain attention and motivation in my students.	M = 2.75 ± .36	t(70) = 7.705	p < .001*	M = 2.06 ± .26	t(129) = 7.909	p < .001*
10. I understand the use of Discrete Trial Teaching in relation to specific skills in the academic environment.	M = 3.17 ± .37	t(70) = 8.657	p < .001*	M = 2.17 ± .25	t(129) = 8.752	p < .001*
Total educator self-efficacy scores	M = 24.00 ± 2.33	t(70) = 10.320	p < .001*	M = 21.49 ± 1.90	t(129) = 11.295	p < .001*
Educator perceptions of the institutional knowledge and culture provided by SEC to support provision of interventions to students with ASD in the school setting. (items 6 and 7)						
6. To this day, I have had sufficient support (knowledge, troubleshooting) by the Secretariat	M = 4.49 ± .32	t(70) = 13.867	p < .001*	M = 2.72 ± .25	t(129) = 10.708	p < .001*

of Education and Culture (SEC) for the realisation appropriate education programmes for students with ASD.						
7. I believe SEC's educational personnel is prepared to take in and appropriately treat students with ASD in preschool and primary school levels, as well as to maximise their learning.	M = 3.18 ± .37	t(70) = 8.640	p < .001*	M = 1.77 ± .25	t(129) = 7.001	p < .001*
Total scores of educator perceptions of supports provided by SEC	M = 7.67	t(70) = 12.515	p < .001*	M = 4.48 ± .44	t(129) = 10.146	p < .001*
Other						
11. What types of behavioural problems do I see in my students with ASD?	M = -0.32 ± .22	t(70) = -1.463	p = .148	M = .05 ± .09	t(129) = .492	p = .624

APPENDIX G

Results of two-tailed t-test analysis of the differences between average scores of in-person and videoconference training groups for each item and for items within specific areas of interest from the *Parent Quality Control Questionnaire*.

	Pre-training			Post-training		
Question	Mean difference between parent and in-training and videoconference-format group scores, SD	T-value	P-value	Mean difference between parent and in-training and videoconference-format group scores, SD	T-value	p-value

Parent perceptions of self-efficacy (items 2, 4, 5, 6, 16, 17 and 18)						
2. I have received sufficient training about the educational and therapeutic attention my child needs.	M = -.20 ± .98	t(19) = -.204	p = .841	M = .75 ± .55	t(19) = 1.090	p = .289
5. I have the knowledge to exercise play-based interventions that allow me to establish a positive relationship with my child.	M = -.15 ± 1.07	t(19) = -.140	p = .890	M = .45 ± .60	t(19) = .755	p = .459
6. I have the knowledge to analyse and modify inappropriate behaviours in my child.	M = .45 ± 1.15	t(19) = .391	p = .700	M = .00 ± .77	t(19) = .000	p = 1
16. I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively.	M = -1.6 ± 1.38	t(19) = -1.162	p = .260	M = -.05 ± .77	t(19) = -.065	p = .949
17. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain my child's attention and motivation.	M = -.80 ± 1.45	t(19) = -.552	p = .588	M = -1.70 ± .97	t(19) = -1.751	p = .096
18. I understand the use of Discrete Trial Teaching in relation to specific skills in home and school environments.	M = -1.05 ± 1.37	t(19) = -.769	p = .452	M = -1.25 ± .99	t(19) = -1.254	p = .225
Total parent self-efficacy scores	M = -3.35 ± 6.78	t(19) = -.494	p = .627	M = -1.80 ± 3.71	t(19) = -.485	p = .633
Parent perceptions of educator instructional efficacy (items 3, 8, 10, 11 and 15)						
3. The needs of my child are satisfied under his/her Individualised education Plan (IEP).	M = .35 ± .75	t(19) = .466	p = .647	M = .25 ± .61	t(19) = .409	p = .687
8. My child is an accepted and included member of his school community.	M = .05 ± .87	t(19) = .057	p = .955	M = .95 ± .59	t(19) = 1.606	p = .125

10. I feel the school personnel are trained to understand the particular needs of my child.	M = .20 ± 4.06	t(19) = .220	P = .828	M = 1.35 ± .72	t(19) = 1.868	p = .077
11. My child is adequately prepared for his/her transition to the next educational level.	M = -.65 ± .85	t(19) = -.765	p = .454	M = 1.10 ± .69	t(19) = 1.590	p = .128
15. I believe the educational personnel in SEC is prepared to take in and appropriately treat students with ASD in preschool and primary school levels, as well as to maximise their learning.	M = .80 ± 1.12	t(19) = .714	p = .484	M = -.50 ± .96	t(19) = -.522	p = .608
Total parent perceptions of educators' instructional efficacy scores	M = .75 ± 3.79	t(19) = .198	p = .845	M = 3.15 ± 2.87	t(19) = 1.096	p = .287

Parent perceptions of the of the supports and implementation of interventions by SEC (items 1, 4, 7, 9, 12, 13, 14)

1. I feel I am an active member in my child 's special education team.	M = .50 ± .56	t(19) = .886	p = .387	M = .05 ± .55	t(19) = .090	p = .929
4. I understand my child's education plan.	M = -1.00 ± .71	t(19) = -1.414	p = .173	M = .30 ± .68	t(19) = .443	p = .663
7. Communication with my child's school and educators is effective.	M = .90 ± .74	t(19) = 1.223	p = .236	M = 1.35 ± .49	t(19) = 2.736	p = .013*
9. I know who to communicate with in my child's school if there is any concern about his/her IEP.	M = 1.20 ± .53	t(19) = 2.281	p = .034*	M = 1.30 ± .54	t(19) = 2.414	p = .026*
12. I have directly contacted personnel from the Secretariat of Education and Culture	M = .40 ± .92	t(19) = .433	p = .670	M = -.05 ± 1.06	t(19) = -.047	p = .963

(SEC) with questions or concerns about my child's indivdualised education plan (IEP).					
13. I have received responses to my communications with school personnel within a reasonable timeframe.	M = -1.20 ± 1.11	t(19) = -1.078	p = .295	M = -.75 ± 1.20	t(19) = -.625	p = .540
14. To this day, I have had sufficient support (knowledge, troubleshooting) from SEC to implement my child's education plan.	M = -.45 ± 1.11	t(19) = -.406	p = .689	M = -.45 ± 1.12	t(19) = -.403	p = .692
Total scores of parent perceptions of supports provided by SEC	M = .35 ± 4.19	t(19) = .084	p = .934	M = 1.75 ± 4.45	t(19) = .393	p = .699
Other					
19. What is your perception of your child's academic programme?	M = -1.85 ± .33	t(19) = -5.529	p < .001*	M = -1.35 ± .41	t(19) = -3.327	p = .004*
20. What types of behavioural problems do I see in my home in relation to my child having ASD?	M = -1.45 ± .39	t(19) = -3.746	p = .001*	M = -1.45 ± .36	t(19) = -4.040	p < .001*

APPENDIX H

Results of two-tailed t-test analysis of the differences between average scores of in-person and videoconference training groups for each item and for items within specific areas of interest from the *Educator Quality Control Questionnaire..*

	Pre-training	Post-training

Question	Mean difference between educator and in-training and videoconference-format group scores, SD	T-value	P-value	Mean difference between educator and in-training and videoconference-format group scores, SD	T-value	p-value
Educator perceptions of their own general knowledge and application of interventions, (items 1, 2, 4, 5, 6, 16, 17 and 18)						
1. I have received sufficient training for the attention of students diagnosed with autism spectrum disorder (ASD).	M = -.75 ± .41	t(70) = -1.812	p = .074	M = -.35 ± .28	t(70) = -1.280	p = .205
2. I have sufficient knowledge to create individualised intervention programmes for students with ASD.	M = -.25 ± .42	t(70) = -.601	p = .550	M = -.14 ± .25	t(70) = -.563	p = .575
3. I have knowledge to implement individualised intervention programmes for students with ASD.	M = -.25 ± .45	t(70) = -.566	p = .573	M = -.08 ± .28	t(70) = -.301	p = .764
4. I have the knowledge to exercise play-based therapy methods that allow me to establish a positive relationship with students with ASD.	M = -.04 ± .43	t(70) = -.099	p = .921	M = -.08 ± .30	t(70) = -.298	p = .767
5. I have the knowledge to analyse and shape inappropriate behaviours in students with ASD.	M = -.19 ± .41	t(70) = -.486	p = .628	M = .18 ± .25	t(70) = .723	p = .472
8. I understand specific behavioural modification concepts such as Extinction and Reinforcement, and how I can apply these at home and other environments effectively.	M = .28 ± .47	t(70) = .604	p = .548	M = .23 ± .24	t(70) = .945	p = .348
9. I understand concepts from play-based intervention such as circle of interaction and interactive play, and can use them at home and other environments to maintain attention and motivation in my students.	M = -.37 ± .48	t(70) = -.768	p = .445	M = .24 ± .22	t(70) = 1.101	p = .275
10. I understand the use of Discrete Trial Teaching in relation to specific skills in the academic environment.	M = -1.08 ± .44	t(70) = -2.458	p = .016*	M = .014 ± .25	t(70) = .055	p = .956

Total educator self-efficacy scores	M = -5.14 ± 2.90	t(70) = -1.770	p = .081	M = -2.66 ± 1.83	t(70) = -1.451	p = .151
Educator perceptions of the institutional knowledge and culture provided by SEC to support provision of interventions to students with ASD in the school setting						
6. To this day, I have had sufficient support (knowledge, troubleshooting) by the Secretariat of Education and Culture (SEC) for the realisation appropriate education programmes for students with ASD.	M = -1.18 ± .40	t(70) = -2.944	p = .004*	M = .45 ± .29	t(70) = 1.566	p = .122
7. I believe SEC's educational personnel is prepared to take in and appropriately treat students with ASD in preschool and primary school levels, as well as to maximise their learning.	M = -.58 ± .39	t(70) = -1.470	p = .146	M = .80 ± .32	t(70) = 2.538	p = .013*
Total scores of educator perceptions of supports provided by SEC	M = -1.76 ± .73	t(70) = -2.41	p = .019*	M = 1.25 ± .54	t(70) = 2.341	p = .022*
Other						
11. What types of behavioural problems do I see in my students with ASD?	M = .75 ± .21	t(70) = 3.636	p < .001*	M = .24 ± .21	t(70) = 1.168	p = .247

APPENDIX I

Research information form for families

Dear parents and educators,

It is a pleasure to meet you. This is the formal presentation of our research team charged with the evaluation of the *Proyecto de Educación Incluyente para Alumnos Autistas en Sonora* (SEC-ETP Project) [Inclusive Education Project for Autistic Students in Sonora]. The research is titled:

Effect of Parent and Educator Training and Intervention on Treatment Outcomes in Autism Spectrum Disorder (ASD): Evaluation of a Public School Programme for Students with ASD

Our team includes:

Daniel Quiñones, M.S. CCC-SLP (Research Director)
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Purpose and Research Questions

As described, the purpose of this research is to evaluate the implementation of a parent/educator training and direct intervention program for students with Autism Spectrum Disorder (ASD) in public school in Sonora, Mexico (SEC-ETP Project).

The PEIAAS includes specific evidence-based interventions from the fields of Applied Behavior Analysis (ABA), play-based and speech and language intervention which have been widely researched and supported as a critical part of non-pharmacological interventions in ASD (Solomon & Chung, 2012). This study will analyze data collected during implementation of the PEIAAS for the second phase of the current school year (February to June of 2020).

The following research questions/hypothesis will be evaluated by collecting routinely collected data from the PEIAAS:

1. Effect of individualized intervention on the severity of symptoms of ASD.

2.   Relationship between the amount of parent training and severity of symptoms of ASD.

3.   Relationship between parents' perceptions of self-efficacy and the severity of symptoms of ASD.

4.   Effect of parent and educator training on self-perceptions efficacy.

5.   Relationship between self-perceptions of efficacy by parents and educators and intensity of individualized intervention.

6.   Effect of parent and educator training on the intensity of individualized intervention.

7.   What factors make the most significant contributions to the decrease of severity scores of ASD?

8.   What areas of the program are perceived to be beneficial to parents and educators? Why do parents and educators think these areas are useful?

9.   What areas of the program are perceived in need for improvement or otherwise modification/analysis?

What data will be collected?
In order to evaluate the program, the researcher will obtain anonymous routinely collected data from the PEIAAS including:

- Demographic information for target students:
    - Age
    - Gender
    - School placement (school, grade and type of classroom)
- Performance and assessment data for students:
    - Assessments of severity of symptoms of ASD.
    - Data from target students' performance obtained via the online platform.

- Data from quality control measures administered to parents and educators:
  - Questionnaires of perceptions of self-efficacy.
  - Attendance records to theoretical training sessions.

Questionnaires

The following questionnaire will be administered in addition to the quality control questionnaires completed as part of the SEC-ETP Project. They will be provided by the assigned clinical supervisor before and after periods of intervention (may-september 2020) with the purpose of measuring the concurrent validity of the self-perception of efficacy questionnaires part of the PEIAAS:

- *New General Self-Efficacy Scale* [Nueva Escala General de Autoeficacia] (Chen, Gully, & Eden, 2001).

Methodology

Statistical analysis will be performed in order to evaluate the relationship between variables such as parent/educator training, intensity of intervention and outcome variables such as severity scores and perceived self-efficacy by parents and educators. Types of analysis for each research question are selected according to the composition of the data collected, and their goal is to answer these questions using numerical comparisons of the variables examined.

Your Participation

Participation in this research project is optional and your choice to participate in this research is in no manner related to your participation in the SEC-ETP Project. Educational support provided by the SEC-ETP Project includes:

- Initial Evaluation and design of Individualised Education Plan by ETP and your special education team.
- Support sessions in person or via videoconference by your assigned clinical supervisor.
- For students for whom it is appropriate and safe, direct intervention sessions by trained and supervised practicum students.
- Training on the use of the electronic platform therapyConnect for collection and interpretation of clinical data obtained during home-based intervention sessions.

From your participation in the current research study, participating families can expect to be part of a collective effort to support and further define best practices in the development of inclusive education programmes for autistic students. The project will be published as a collaborative effort between ETP and SEC and their stakeholders.

How will data be stored and disposed of?

Data collected for the purposes of this study will be stored and disposed of according to the guidelines of the General Data Protection Regulation (GDPR). This includes anonymisation of data, a process in which research data extracted is assigned a randomly generated ID number, and will not include names, last names or any other piece of information that can be traced directly to any of the participants.

Data will be coded and kept on a password protected CD in the CP programme office in a locked cabinet and in the researcher's possession for 10 years after the study is completed.

Procedures will also remain compliant with the Ley Federal de Protección de Datos Personales en Posesión de Particulares (LFPDPPP) [Federal Law of Protection of Personal Data in Private Possession] in Mexico.

Once data is extracted, participants can still withdraw authorization for their use, as long as they have not been analyzed and used as part of the research.

The results of this study will be published as part of a doctoral thesis at the Salomons Centre for Applied Psychology in Canterbury Christ Church University. The main investigator is Daniel Quiñones, M.S. and the thesis supervisors are Director of Faculty and Research Professor Jan Burns and Professor of Psychology and Sociology Alex Hassett.

Safeguarding vulnerable families and individuals.

Clinical supervision protocols at ETP require any staff with direct contact with clients/families to report any evidence, reported or observed of instances of abuse, neglect of otherwise situations that may place any person at risk.

All staff are required to document and escalate their concern to their clinical supervisor or otherwise manager for appropriate referral and discussion by the clinical direction team in charge.

The clinical direction team involved in the SEC-ETP Project (Psic. Patricia Pérez, Daniel Quiñones, M.S. CCC-SLP, Psic. Ana Lucía Olivas and Psic. Andrea Morales) document and follow these cases in order to report, provide adaptations or provide support as required by local and state guidelines and appropriate.

APPENDIX J

New General Self-Efficacy Scale (Chen, Gully, & Eden, 2001)

Select a number for each of the following statements:	↓				
I am able to achieve most of the goals that I have set for myself	1 strongly disagree	2	3	4	5 strongly agree
When facing difficult tasks, I am certain that I will accomplish them.	1 strongly disagree	2	3	4	5 strongly agree
In general, I think that I can obtain outcomes that are important to me	1 strongly disagree	2	3	4	5 strongly agree
I believe I can succeed at most any endeavor to which I set my mind.	1 strongly disagree	2	3	4	5 strongly agree
I will be able to successfully overcome many challenges.	1 strongly disagree	2	3	4	5 strongly agree
I am confident that I can perform effectively on many different tasks.	1 strongly disagree	2	3	4	5 strongly agree
Compared to other people, I can do most tasks very well.	1 strongly disagree	2	3	4	5 strongly agree
Even when things are tough, I can perform quite well.	1 strongly disagree	2	3	4	5 strongly agree

APPENDIX K

Instructional Performance Checklist

Select an option for each of the following:	1 Support not enough or displays resistance	2 Requires team work at all times	3 Requires moderate support	4 Satisfactory with support	5 independent
1. Demonstrates knowledge of session structure and order, including detailed knowledge of relevant procedures, programs or protocols.	1	2	3	4	5
2. Prepares materials and records data in an efficient and effective manner. Communicates essential needs appropriately and efficiently.	1	2	3	4	5
3. Knows theory and practical implementation of current programming.	1	2	3	4	5
4. Utilizes proper technique at all times, according tothe established by the intervention team or as dictated by the clinical supervisor.	1	2	3	4	5
5. Establishes and maintains healthy and productive working relationships with families and other team members. The nature of such relationships positively impacts the implementation of the supervision model.	1	2	3	4	5
6. Creates a comfortable environment for the child.	1	2	3	4	5
7. Avoids access to toys or desired items without the instructor's participation or assistance.	1	2	3	4	5
8. Acts as a facilitator.	1	2	3	4	5
9. Suggests activities instead or asking or demanding.	1	2	3	4	5
10. Takes toys or desired items away with anticipation..	1	2	3	4	5
11. Tries to make each activity more fun to the child.	1	2	3	4	5
12. Responds favorably to bids for play by the child.	1	2	3	4	5
13. Imitates the child (with the exception of dangerous or inappropriate behaviors).	1	2	3	4	5
14. Stays within the child's visual field of perception.	1	2	3	4	5

15. Follows the child's lead, lets the child direct games or activities.	1	2	3	4	5
16. Avoids using instructions or other types of demands.	1	2	3	4	5
17. Limits use of "adult" language.	1	2	3	4	5
18.Introduces names of objects as the child tries to obtain them.	1	2	3	4	5
19. Reinforces vocalizations when the child makes a verbal request.	1	2	3	4	5
20. Has a wide repertoire of activities at his/her disposal.	1	2	3	4	5
21. Uses gestures, tone and body language to communicate effectively.	1	2	3	4	5
22. Helps the child manage own frustration when offering alternatives.	1	2	3	4	5
23. Insists to obtain the child's response.	1	2	3	4	5
24. Uses childish games such as dissapearing, chasing or hands/singing play.	1	2	3	4	5
25. Helps the child manage anxiety by using gestures, words and solving problems.	1	2	3	4	5
26. Carries out protocols as documented in the treatment plan.	1	2	3	4	5
27. Identifies activities of daily living and uses objects or toys to act out those scenarios.	1	2	3	4	5
28. Responds to real desires with imaginary actions.	1	2	3	4	5
29. If the child uses an object or toy, demonstrates its appropriate use (i.e. pour imaginary water when the child holds a cup).	1	2	3	4	5
30. Uses imaginary play devices such as costumes, props or puppets.	1	2	3	4	5

31. Substitutes objects by others to serve the same function.	1	2	3	4	5
32. Adds detail to play-based routines.	1	2	3	4	5
33. Uses moments as they come up to explain ideas or concepts.	1	2	3	4	5
34. Helps the child demonstrate control over his or her environment.	1	2	3	4	5
35. Places obstacles on purpose when playing to demonstrate a solution.	1	2	3	4	5
36. Uses play to place the child's actions in context.	1	2	3	4	5
37. Focuses on problem-solving.	1	2	3	4	5
38. Uses a tone of voice appropriate to the situation (i.e. pretends to cry when hurt).	1	2	3	4	5
39. Acts out events that have caused negative emotions to help the child process them.	1	2	3	4	5

APPENDIX L
Participation in research consent form for parents

Effect of Parent and Educator Training and Intervention on Treatment Outcomes in Autism Spectrum Disorder (ASD):
Evaluation of a Public School Programme for Students with ASD

Permission for Data collection
Please carefully read and complete this form. If you wish to participate in this study, circle "yes" at the right of each of the following items. If you do not understand any part of this form or need more information, please ask the supervisor administering this questionnaire.

Draw a circle around "yes"or "no" for each statement.	↓	
I understand participation in this study is optional. The nature of the research study has been explained to my satisfaction, and I have been provided with written information about the study.	yesí	no
I understand that this research involves the scientific study of the efficacy of an inclusive education program for students with autism spectrum disorder in the State of Sonora.	yes	no
I understand I may choose to be excluded from the study at any moment without providing any explanation. I understand this does not in any manner influence my participation or that of any of my children/students in the Proyecto de Educación Incluyente para Alumnos con Autismo en Sonora.	yes	no
I understand all of the information collected will be managed with appropriate levels of confidentiality and I will not be named or otherwise identified in any publication product of this study.	yes	no
I understand all data collected will only be used for the purposes of the current research and will be securely stored for a minimum of ten years as described in this document.	yes	no
I understand any information collected will only be discussed with the research team.	yes	no
I understand participants, schools or organizations will not be named in publications subsequent to the current study.	yes	no

I freely give consent to the collection of information stored in the therapyConnect database belonging to my profile or that of my child, and I understand the data collected will only be used for purposes of the current study.	yes	no
I freely give consent to participate in the current research study and I have been provided with a copy of this document.	yes	no

Signature: _____

Full name (all uppercase): _____

Date: _____

Address: _____

_____

Email address: _____

Phone number: _____

Thank you for your interest and participation in this study.

APPENDIX M
Participation in research consent form for educators

Effect of Parent and Educator Training and Intervention on Treatment Outcomes in Autism Spectrum Disorder (ASD):
Evaluation of a Public School Programme for Students with ASD

Permission for Data collection
Please carefully read and complete this form. If you wish to participate in this study, circle "yes" at the right of each of the following items. If you do not understand any part of this form or need more information, please ask the supervisor administering this questionnaire.

Draw a circle around "yes"or "no" for each statement.	↓	
I understand participation in this study is optional. The nature of the research study has been explained to my satisfaction, and I have been provided with written information about the study.	yesí	no
I understand that this research involves the scientific study of the efficacy of an inclusive education program for students with autism spectrum disorder in the State of Sonora.	yes	no
I understand I may choose to be excluded from the study at any moment without providing any explanation. I understand this does not in any manner influence my participation in the Proyecto de Educación Incluyente para Alumnos con Autismo en Sonora.	yes	no
I understand all of the information collected will be managed with appropriate levels of confidentiality and I will not be named or otherwise identified in any publication product of this study.	yes	no
I understand all data collected will only be used for the purposes of the current research and will be securely stored for a minimum of ten years as described in this document.	yes	no
I understand any information collected will only be discussed with the research team.	yes	no
I understand participants, schools or organizations will not be named in publications subsequent to the current study.	yes	no

I freely give consent to the collection of information stored in the therapyConnect database belonging to my profile, and I understand the data collected will only be used for purposes of the current study.	yes	no
I freely give consent to participate in the current research study and I have been provided with a copy of this document.	yes	no

Signature: _____

Full name (all uppercase): _____

Date: _____

Address: _____

_____

Email address: _____

Phone number: _____

Thank you for your interest and participation in this study.

APPENDIX N
Quality control questionnaire

Parent or educator (circle):   parent/educator
Municipality: _____
Date: _____

Please answer by writing in the space for each question. You may be provided with additional paper if needed.

1. What are the aspects of the SEC-ETP Project that you feel were the most effective?
2. In your opinion, why were these aspects effective?
3. What are the aspects of the SEC-ETP that you feel were the least effective or need improvement?

4. In your opinion, why do these areas need improvement?