Rhodes University — Department of Psychology

Research project cover sheet

To accompany a research project submitted for examination in partial fulfilment of the requirements for the Honours Degree in Psychology / Organisational Psychology

1. Information	
Student's name	Anja Stefanie Hinz
Type of thesis	Systematic Review
Supervisor's name	Jan Knoetze

2. Declaration by supervisor

Either:

This project has been prepared under my supervision. I have read it carefully and believe that it meets the standards set out in the appropriate guidelines booklet in terms of academic content, clarity of research question, description of methodology, quality of analysis and ethical standards, as well as in terms of format, length, structure and referencing.

Signature and date:

Or:

This project has been prepared under my supervision using the guidelines set out in the appropriate guidelines booklet in terms of format, structure and referencing. However, I am not convinced that it meets the required academic standards with regards to academic content, clarity of research question, details of the methodology, quality of analysis, or ethical aspects.

Signature and date:

Student's signature and student number:

G20H6531

A Systematic Review of Literature examining the efficacy and effectiveness of the Developmental, Individual-Difference, Relationship-Based Model (DIR)/Floortime intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries.

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Thesis submitted in partial fulfilment of the requirements for the degree of Bachelor of Arts with Honours in Psychology.

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Abstract

The DIR/Floortime model focuses on the child as a holistic entity and views the treatment of Autism Spectrum Disorders in much the same way, acknowledging that every child has a unique biological profile, with their own sensory, cognitive, and affective abilities and individual strengths and weaknesses. However, researchers have primarily conducted studies in minority world countries, and thus the results of previous research are not necessarily generalisable to majority world countries (see Appendix A). The objective of this systematic review was to consult published studies conducted in majority world countries to determine whether the DIR/Floortime interventions are effective and efficacious in the treatment of pre-adolescent children diagnosed with Autism Spectrum Disorders. As there is limited published literature on this topic, the methodological design of a systematic review was chosen, due to its ability to locate and highlight gaps in the literature for a specific topic. The findings highlight the need for more research to be conducted in other majority world countries and low-income and low-education families before determining whether the DIR/Floortime intervention is truly effective and efficacious in all majority world countries.

Keywords: DIR; Floortime; Autism intervention; Autism Spectrum Disorders; majority world countries

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1. Autism Spectrum Disorder

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (American Psychiatric Association, 2013), describes Autism Spectrum Disorder (ASD) as being a mental disorder with deficits in three primary areas across various contexts: 1) social-emotional reciprocity, 2) non-verbal communication, and 3) development and maintenance of relationships. The severity of these deficits is dependent on age and developmental level. These deficits are accompanied by further restrictions in activities, interests, or behaviours, which may manifest in many ways. For example, the individual may experience 1) hyper- or hyposensitivity to input from the senses, 2) repetitive movement or speech, 3) inflexibility when it comes to routine or patterns of behaviour, or 4) abnormal fixations or restricted interests. The DSM-5 uses Autism Spectrum Disorder as an umbrella term that includes disorders such as autism and Asperger's Syndrome (American Psychiatric Association, 2013).

1.1. Prevalence Rate

Autism Spectrum Disorder (ASD) was previously believed to be a disorder confined to the western world (Uwaezuoka, 2015), however, in recent years there has been an increase of evidence to the contrary. Studies conducted internationally and cross-culturally show that there is simply a lack of knowledge on ASD in majority world countries (Elsabbagh & Hahler, 2014). Despite having a biological basis, cultural differences and a lack of education still appear to have an impact on the presentation and understanding of the disorder, the symptoms and the most effective way to treat it (Uwaezuoka, 2015). For example, in Africa, where autism research is rare, 71% of confirmed diagnoses are severe, which suggests that the prevalence rate could be significantly underestimated and skewed towards the more easily recognised cases (Bakare & Munir, 2011). Similar results are found in China, where many cases of autism are misdiagnosed as mental retardation, and caregivers only consult medical professionals approximately seven months after they first notice symptoms because they believe their children will grow out of them (Daley, 2004). It has been proven that ASD affects many across the globe, with The World Health Organisation (2019) reporting the prevalence rate to be around 1 in every 160 children worldwide. How accurate this number is, is uncertain due to varying reports across minority world countries and a lack thereof in majority world countries. Despite the lack of reporting in certain parts of the world, it is still evident that the ASD prevalence continues to rise across the globe (Elsabbagh & Hahler, 2014). However, due to the lack of ASD research being conducted in South Africa, there were no reports found that indicate the prevalence and incidence of ASD in the South African context.

1.2. Importance of Early Diagnosis and Intervention

The processes of early diagnosis and intervention are extremely important. Diagnosing the problem in early childhood can ensure that children with ASD receive enough support and care, for them to go through life with as few restrictions as possible. Without a diagnosis, life could be very difficult and distressing for this individual and their family, often causing them to act out or isolate themselves from others (Norwich & Russell, 2012). Once diagnosed, caregivers can have a better understanding of the child's behaviours and seek out appropriate care or early intervention programmes. It can also prevent the onset of other psychiatric or mental disorders, such as depression and anxiety, that are often comorbid with ASD. Early interventions are crucial because when untreated, a child with ASD may reach a point where they start deteriorating mentally. In the 1960s and 70s, the outcomes of children diagnosed with ASD were so poor that most of them were placed in mental institutions due to the lack of effective treatments (Ashbaugh, Bradshaw, Koegel, & Koegel, 2014). Not receiving early interventions may also result in the child growing up with cognitive, sensory, social or behavioural difficulties that will limit what they can get out of life. Handleman and Harris (2000) conducted a comparative study testing whether intervening earlier in life rather than later would have an impact. They found that children aged between 2.5 and 4 years made more significant gains in their IQ than children aged between 4 and 5.5 years. Studies conducted by Lovaas (1987) and Graupner and Sallows (2005) also found that when intervening early, many ASD children could eventually move to mainstream classes and some may no longer meet the diagnostic criteria for ASD. The consensus is that for the best possible results, the interventions must be implemented at the earliest age possible (Nopmaneejumruslers & Pajareya, 2011; Bruckman, Ferch, Necheles, & Solomon, 2007; The National Research Council, 2001) and that this wait-and-see approach (Chung & Solomon, 2012), that many medical professionals hold, could have severe negative consequences for children diagnosed with ASD (The National Research Council, 2001).

The wait-and-see approach (Chung & Solomon, 2012) often leads to ASD children developing additional symptoms that become more severe over time, which would result in them requiring more support later in life and involves higher costs for treatment. The development of behaviours, such as aggression, self-harm or severe tantrums, is also common in untreated cases. These do not constitute part of the primary symptoms of ASD but are instead the result of those primary symptoms going untreated. These behaviours are a reaction, brought on by the child's inability to communicate effectively, and thus these can easily be avoided by

implementing intervention programmes aimed at teaching appropriate behaviour and communication (Ashbaugh et al., 2014).

1.3. Difficulties Involved with Diagnosis

Disorders of relation and communication, like ASD, are difficult to diagnose and treat due to their complex and confusing nature. It is often unclear whether the developmental dysfunction will turn out to be severe or whether it is merely something that will self-correct over time. This uncertainty is often the reason for delayed diagnoses of severe disorders (Greenspan & Wieder, 1997). Healthcare professionals tend to hold a wait-and-see approach because they do not want to alarm the parents if it does end up being a self-correcting problem (Chung & Solomon, 2012). The considerable variation of symptoms in Autism Spectrum Disorders, and a lack of accurate research on the efficacy of interventions, is also a significant contributor to this (Greenspan & Wieder, 1997). There is no single treatment for ASD that is accepted by all medical professionals or caregivers. Each child differs from the next with regards to symptoms and severity, and thus there can be no single treatment that works for all. Caregivers need to be provided with accurate knowledge on the available interventions and especially on their efficacy and effectiveness so they can make an informed decision on what works best for their child, while considering their symptoms and severity (Gangat et al., 2017).

2. Behavioural model vs. Developmental social-pragmatic model

While many researchers agree that intensive early interventions are the best course of treatment for children with ASD (Nopmaneejumruslers & Pajareya, 2011; Bruckman et al., 2007; The National Research Council, 2001), there is little to no evidence that one treatment is better than the rest. Two primary models are based on the premise of early intensive interventions, namely the developmental social-pragmatic model and the behavioural model (Bruckman et al., 2007). Behavioural-based approaches make use of reinforcement to encourage children to behave appropriately, while ignoring those behaviours that are deemed inappropriate. The Applied Behavioural Analysis (ABA) intervention is an example of this approach (Lovaas, 1987). It aims to decrease repetitive behaviours and improve communication and socialisation skills through discrete behaviour trials involving positive reinforcement. Each skill is broken down into a series of small steps, and the child must master each step before they can move onto the next one (Delmolino & Harris, 2002). Lovaas (1987) conducted a study providing intensive ABA treatment to children with ASD and found that 47% of the children who received this intervention were able to move to mainstream classes after the treatment period. However,

these behavioural approaches are significantly questioned by researchers (Handleman & Harris, 2000; Milton, 2014) and have many criticisms. The primary criticism of these approaches is that the child's skill learning and interactions only take place in artificial environments, and they are thus unable to apply what they learn to real-world situations (Bruckman et al., 2007). Other criticisms include being too dependent on cues, an inability to self-initiate behaviour, as well as having a lack of spontaneity (Nopmaneejumruslers & Pajareya, 2011). It is thus believed that a child's interactions should rather take place in a natural setting where they can learn to engage more logically and creatively and generalise these engagements to real-world interactions. The developmental social-pragmatic model has gained traction due to it being a more 'natural' approach. This approach focuses on the caregiver-child relationship and makes use of their everyday interactions to promote communication in children with ASD, which also allows for the child to generalise their learned skills to real-world settings (Greenspan, 2001).

3. Social-Pragmatic Intervention Guidelines

The National Research Council (2001) of America stated that "effective services will and should vary considerably across individual children, depending on a child's age, cognitive and language levels, behavioural needs, and family priorities" (p. 220). Furthermore, the National Institute for Health and Care Excellence [NICE] (2013), in the United Kingdom, laid out a clinical guide for the treatment of ASD and recommended that the intervention must 1) involve play-based interactions designed to expand the child's communication abilities, 2) be adjusted to each child's unique developmental profile, 3) include therapist modelling, and 4) have the aim of improving the parent-child relationship while making the parent more sensitive to the child's way of communicating. The Developmental, Individual-Difference, Relationship-Based (DIR)/Floortime intervention, the focus of this systematic review, considers all of these features to be its core principles (Greenspan & Wieder, 1997). The implementation of these policy guidelines within South Africa and other majority world countries would be highly beneficial to ASD children within this context because it is home to people from many different cultures, backgrounds, and beliefs. These guidelines ensure that interventions are adjusted to, and show consideration for, a child's individual needs, culture and abilities.

4. The DIR Model

Stanley Greenspan and Serena Wieder developed the DIR Model with the aim of using it with children diagnosed with ASD and their caregivers. They state that even if the specific

symptomatic presentation of ASD is not considered "the goal of treatment will be not only to alleviate it but also to facilitate the child's progress toward an age-appropriate developmental level and toward an age-appropriate degree of stability and range of thematic experience at that level" (2006, p.163). This approach aims to help caregivers, educators, and professionals construct a program tailored towards helping each child improve their ability to function across all developmental capacities with which they may be struggling. It is focused on the child's emotions because Greenspan and Wieder (2003) believe these to be the foundation for all development and learning and enable a child's brain to build and improve their levels of intellectual, social and emotional capacities. The model supports child development and does so through early intervention and play (Hess, 2013). According to Greenspan and Wieder (2003), play is an essential skill for children to learn, especially those with special needs, because interactive play can help a child with ASD develop their capacity for communicating and relating better than any other approach. However, for children diagnosed with ASD, reaching the various stages of play development can be difficult due to their poor communication and motor planning, and lack of fine motor movements, which are often necessary for play (Hess, 2013). This is why the DIR model places significant emphasis on caregiver and family involvement in therapy and tailoring the intervention to each child's strengths and weaknesses, to ensure they get the support they need to develop further (Greenspan & Wieder, 2003). Each child is unique, and even though children with ASD share a diagnosis, they still have their unique developmental pattern and own way of functioning, which is why "the DIR model examines the functional developmental capacities of children in the context of their unique biologically based processing profile and their family relationships and interactive patterns" (Greenspan & Wieder, 2003, p. 426).

The foundation of this model is best explained in terms of its three components: **D** for developmental factors (or functional milestones), **I** for individual differences, and **R** for relationship aspects. Each of these components is a new facet of development that needs to be understood on its own before it can be understood as a whole (Greenspan & Wieder, 2003).

Developmental capacity

The functional emotional development of a child determines whether they can integrate their language, motor, sensory, cognitive and spatial capacities to accomplish a meaningful goal (Greenspan & Wieder, 2003). In a child's early years, there are six milestones that contribute towards their overall development, which include the capacity for 1) shared attention and

staying regulated, 2) relating to others, 3) two-way communication, 4) problem-solving skills, 5) communicating their needs and coming up with play ideas, and 6) logical thinking. Mastery of these milestones is necessary to move onto more advanced ways of understanding, experiencing and thinking: self-reflecting, grey-areas, morals (Greenspan & Wieder, 2006).

Individual differences

Children with ASD have individual differences that are the result of biological variations and/or deficits that impact how they see their surroundings, as well as how incoming information is processed. These differences can be characterised in terms of:

1. Sensory modulation
2. Sensory processing
3. Sensory-affective processing
4. Motor planning and sequencing

These factors need to be considered and addressed to support development (Greenspan & Wieder, 2003).

Relationship aspects

A child's environments and relationships provide them with interactions through which their cognitive, emotional and social capacities can be encouraged, developed and practised. These learning relationships can be between the child and their educators, peers, caregivers, therapist or anyone who moulds their interactions to fit the autistic child's functional emotional development and individual differences. These interactions need to enable the child to progress up the developmental ladder, towards mastery of the essential foundations (Greenspan & Wieder, 2003). If these interactions are not moulded to the uniqueness of each child, it may result in the autistic child missing an essential developmental milestone, causing delays in their developmental progress. Often caregivers lack the necessary skills to engage with their autistic children and can become an inappropriate contribution to the child's life. Thus, the idea of parents as therapists was introduced into the DIR model (Greenspan and Wieder, 1999). It is well documented that across all therapies, parental involvement is a central dimension of any therapeutic success in children (Honey, McConachie, & Oono, 2013; Haine-Schlagel & Walsh, 2015). Greenspan and Wieder (1999) found that providing caregivers with the therapeutic capacity to engage with their children allowed them to provide essential experiences that would aid the implementation of the DIR model. Therefore, by strengthening the parent-child

relationship, it can help bring a meaningful and therapeutic experience to playtime while also moving the child up the developmental ladder.

5. Floortime

Floortime is a component of the DIR model, and Simpson (2005) defines it as a "play-based interactive intervention approach that emphasises individual differences, child-centred interests, and the affective interactions between child and caregiver" (p. 26). Floortime involves the child and the therapist or caregiver interacting with one another in play and learning activities that typically take place on the floor of the child's play area but later go on to include other places as well. The purpose of this is to make the child as comfortable with the interaction as possible and to show one is trying to engage with the child on their level and within their comfort zone (Simpson, 2005). Floortime is a play-based technique that focuses on the unique neurological processes of each child (Hess, 2013), where the caregiver follows the child's lead as they engage with their natural interests, while simultaneously challenging the child to master their developmental capacities. The caregiver plays an active role in creating fun games, activities and interactions that are directed towards the developmental levels and interests of the child. The caregiver needs to follow the child's lead while utilising facial expressions, sound effects and gestures that will capture the child's attention and encourage them to engage. These Floortime sessions are aimed at deepening the child's engagement, opening up two-way communication and lengthening it, encouraging purposeful behaviour and developing their intellectual, social and emotional capacities through play interactions and conversations (Greenspan & Wieder, 2003).

There are five steps in the Floortime process:

1. Observe: In this first step, it is important to both watch and listen to the child to determine the best way to approach them. This includes taking note of their body language, facial expressions, tone of voice and the things they say because they are key indicators of a child's communication style (Messina, as cited in Simpson, 2005).
2. Open the circle of communication: Here, the caregiver or therapist approaches the child using gestures or words that are appropriate for the child's behaviour style and mood. The caregiver opens the circle of communication by acknowledging the emotional nature of the child and building onto the child's interest (Messina, as cited in Simpson, 2005).

3. Follow their lead: In this step, the caregiver must follow the child's lead and be a supportive and engaging play partner. The caregiver must allow the child to direct the play activities, create situations and set the mood. This support and acceptance of their play gives the child a sense of success and control, builds their self-esteem and provides them with a sense that they have an effect on the world. It allows the child to feel understood and connected with their caregiver (Messina, as cited in Simpson, 2005).
4. Extend and expand: While it is important to follow the child's lead in Floortime, it is also essential that the parent expands on their play themes by making encouraging and helpful comments directed at the child's play. It is vital that this not be done in an intrusive manner. Instead of responding to the child's play critically, it should instead be done empathetically, as this will inspire the child to be more expressive with their ideas and help them "clarify the emotional themes involved" (Messina, as cited in Simpson, 2005, p. 28).
5. Close the circle of communication: The child closes the circle of communication by responding to the caregiver's gestures and words with their own. As one circle closes, another opens, and it becomes a continuous cycle of interactions between caregiver and child. Through this process, the child learns to understand and appreciate two-way communication (Messina, as cited in Simpson, 2005).

6. Review of Key Literature

Researchers exploring the efficacy and effectiveness of the DIR/Floortime model, for the treatment of autistic children, have often based their findings on caregiver perceptions of the intervention. Bellini, Hume and Pratt (2005) conducted a study examining parents' perceptions of early intervention programmes. The survey was conducted on 195 parents of children diagnosed with ASD or Pervasive Developmental Disorder (PDD), aged 2 to 8 years old. Based on the caregivers' responses to the survey, the report concluded that 93.3% of parents found that the intervention was effective and contributed significantly to their child's development and growth. The positive perception towards DIR/Floortime was also found in other studies (Bruckman et al., 2007; Hongsanguansri, Kiatrungrit, Nopmaneejumruslers, & Praphatthanakunwong, 2018; Nopmaneejumruslers & Pajareya, 2012), where, for example, research by Nopmaneejumruslers and Pajareya (2012) showed a 91% parent satisfaction rate, and research by Bruckman et al. (2007) showed a parent satisfaction rate of 90%.

Bruckman et al. (2007) implemented an 8 to 12-month intervention based on the DIR/Floortime intervention developed by Stanley Greenspan. 68 children, aged between 18 months and 6 years, participated in the intervention, and all parents were provided with a detailed training manual and a one-day workshop on how to implement the intervention. Participants received play therapy for a minimum of 15 hours a week and approximately 600-800 hours in total. The outcome of the study showed that the children made significant improvements in their socio-emotional development and two-way communication.

Mahoney, Solomon, van Egeren, Quon Huber and Zimmerman (2014) conducted a year-long randomised control study examining the effectiveness of the Play and Language for Autistic Youngsters (PLAY) project which was based on the DIR model. They used random assignment to allocate 128 families to either the community service group or the PLAY intervention group. While the community service group only received free special education and one hundred hours of private speech therapy, the treatment group received six hundred hours of play treatment, implemented by their parents, with an additional one hundred hours of community services. The results of the study showed that while the treatment group showed no change in their language quotient, they did show significant improvement in their autistic symptoms, functional emotional development and parent-child interaction skills.

Casenhiser, Shanker and Stieben (2011) developed a DIR-based intervention to examine its effects on the social interaction and communication skills of autistic children. This report discusses preliminary data of a one-year study, based on 51 children, as part of a larger ongoing study. These children were randomly assigned to one of two groups, ending up with 25 children in the DIR-based treatment group and 26 in the community services group. The intervention group received DIR style treatments for two hours each week for the year, while the control group received a combination of available community services, such as speech therapy, holistic diets and occupational therapy. At the end of the 12-month study, the children in the treatment group displayed a significant improvement in their social interaction skills. However, researchers found very little difference in their development of language skills.

Treatment outcomes show that, following participation in DIR/Floortime interventions, children diagnosed with ASD showed significant improvement in autistic symptoms, hyper-/hypoactive sensitivity, and repetitive behaviour (Nopmaneejumruslers & Pajareya, 2012). Further research also showed improvement in two-way communication (Chen et al., 2014),

functional emotional development (Mahoney et al., 2014), social interaction skills (Casenhiser et al., 2011) and turn-taking skills (Chhabria & Lal, 2013), following treatment. Although these studies show promising results, their replicability and generalisability are limited due to research design, convenience sampling, small sample size, varying amounts of treatment in intervention groups, and many results being based on parent report. Mercer (2017) examined existing research on the topic and concluded that the DIR intervention is, at least to some extent, a plausible intervention, when looking at theories on early childhood development. However, he states that the assessment of its plausibility remains incomplete due to severe design flaws in the existing research.

In summary, research has been conducted on DIR/Floortime as an intervention for Autism Spectrum Disorder, showing positive results through studies and parent-perception surveys. However, no systematic review has been published examining the efficacy and effectiveness of the DIR/Floortime intervention within majority world countries.

7. Importance of this Systematic Review

Despite proof that ASD is also prevalent in majority world countries, there is still a lack of research conducted on the efficacy and effectiveness of interventions within these contexts. Research is primarily conducted in minority world countries, where there are more advanced support services, the use of diagnostic instruments is common, and screenings are part of standard healthcare. This results in considerable disparities in prevalence rates across the world, with low figures being reported in majority world countries and high prevalence rates being reported in minority world countries (Uwaezuoka, 2015). In most majority world countries, finding available and effective treatment interventions is difficult. In countries like Thailand, India and South Africa, the provision of intensive interventions is not possible for most families due to a lack of healthcare professionals with adequate training and time to support and provide treatment to children with ASD (Nopmaneejumruslers & Pajareya, 2011; Uwaezuoka, 2015). However, with DIR/Floortime being a parent-led intervention, it may be the most appropriate and easily accessible intervention for these countries.

Furthermore, a preliminary search of the literature reveals that less than a third of reported studies were conducted in majority world countries. It is widely known that ASD symptoms and severity vary significantly from one person to the next, and this is also especially the case cross-culturally. Lotter (1978) conducted a study examining how effective autism screening

tools were across countries and cultures and found that certain behaviours, such as self-aggression and hand-flapping, that were characteristic of autistic children in the West were uncommon in his sample of 1300 African children. Another study, conducted by Collins et al. (2006), confirmed Lotter's (1978) results and found that in their sample, rocking was not a common symptom, while 10/14 of the study participants were non-verbal.

The number of ASD diagnoses is increasing drastically every year, and there is still very little research being conducted examining the efficacy and effectiveness of various intervention techniques. Although there is evidence to suggest that DIR/Floortime is a successful intervention for children with an autism spectrum disorder, as of yet, no systematic review has been published on its effectiveness and efficacy in majority world contexts. Due to the lack of research on the topic and the differences in symptom expression cross-culturally, it is imperative that a systematic review is conducted that captures the existing research, to provide caregivers and healthcare practitioners in majority world countries with a direction in the use of the DIR/Floortime Model for autistic children. Thus, the following systematic review will be examining the efficacy and effectiveness of DIR/Floortime as an intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries.

Both the efficacy and effectiveness of these DIR/Floortime interventions will be studied. When examining the efficacy of an intervention, one assesses whether it works under ideal and controlled conditions. Participants are closely monitored to ensure that they adhere to the study protocol. Because the intervention is implemented under strict conditions, other confounding factors will be limited, and thus there will be less risk. Confounding factors could be certain medications, diets or other concurrent interventions. When examining the effectiveness of an intervention, on the other hand, one assesses whether it works under more realistic circumstances; i.e. real-world conditions. Participants do not need to adhere to the study protocol as strictly, and this is not as closely monitored. Because the intervention is implemented under more real-world conditions, it is possible for other confounding factors to have an impact on the intervention (Ernst, 2006).

8. Research Design and Methodology

In this section, the research design and methodology will be laid out and discussed under the headings of research question, inclusion and exclusion criteria, perform literature search, screen the search results, evaluate the quality of included studies, synthesise the evidence and

disseminate the findings, showing ethical consideration, and ensuring trustworthiness and integrity.

This study will not be using the approach of an effect-size meta-analysis but rather a narrative qualitative systematic review. In contrast to meta-analyses, that are concerned with statistical variance and effect size, this methodology aims to collect, synthesise, and criticise an extensive collection of literature in order to assess the quality of how they relate to and answer a particular research question. The purpose of this systematic review is then aimed at highlighting gaps in the literature to show that there is a difference between what we currently know and what we could know in the future (Hedges, Siddaway, & Wood, 2019). It follows a transparent and objective methodological approach to researching as it does not merely look at single studies but instead draws its findings from all the studies related to assessing the efficacy and effectiveness of DIR/Floortime interventions on treating pre-adolescent children with ASD in majority world countries (Petticrew & Roberts, 2006). The presentation and methodology of a systematic review aim to reduce bias and subjectivity in research through the use of a priori defined inclusion and exclusion criteria (Hedges et al., 2019). The rest of this methodology section describes the research process followed throughout this systematic review. The six steps, laid out by Petticrew and Roberts (2006) that were followed when engaging in data collection, synthesis, and interpretation for the systematic review, are listed below:

1. Select a relevant research question.
2. Define the inclusion and exclusion criteria.
3. Conduct a literature search.
4. Screen the search results.
5. Evaluate the quality of included studies.
6. Synthesise the evidence and disseminate the findings.

8.1. Research question

The purpose of a systematic review is to collect, synthesise, and criticise an extensive collection of literature in order to assess the quality of how they relate to and answer a particular research question. This will then highlight the gaps in the literature to show that there is a difference between what we currently know and what we could know in the future (Hedges et al., 2019) The following systematic review sets out to answer the below research question:

How effective and efficacious is Developmental, Individual-Difference, Relationship-Based Model (DIR)/Floortime as an intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries?

The systematic review is guided by this research question and an adaption of the PICO(T) analysis, which includes consideration for:

- Population – pre-adolescent children diagnosed with Autism Spectrum Disorders.
- Intervention – DIR/Floortime intervention.
- Outcomes – potential positive and negative impacts of the intervention.
- Context – majority world countries (Appendix A).
- Time – papers published from 2000 to present.

8.2. Inclusion and exclusion criteria

To determine which studies were to be included or excluded from the systematic review, a set of eligibility criteria were used, which furthermore determined the operational definition of the research question. The selection of appropriate eligibility criteria was critical to ensuring that no study was accidentally excluded without proper evaluation of its relevance (Meline, 2006). The inclusion criteria used for this systematic review are as follows:

- *Publication date:* The DIR model was developed in the 1980s (DIR®/Floortime® Model, 2020) but due to a focused interest on recent research, only studies published between 2000 and the present were included.
- *Study type:* Both quantitative and qualitative studies were considered for the review. Other systematic reviews on the topic were also considered as these could add valuable direction and other studies missed through normal search.
- *Participants:* The focus of the review falls on pre-adolescent children diagnosed with ASD, and thus studies examining children aged 0-12 years, who have been diagnosed with ASD by a medical professional were considered.
- *Interventions:* Studies that examine the efficacy or effectiveness of DIR/Floortime interventions were selected for review.
- *Context:* Studies were selected based on their geographical context. The systematic review focuses on the efficacy and effectiveness of DIR/Floortime interventions in majority world countries, and thus only studies conducted within these countries were considered.

Therefore, to summarise, a table is provided:

	Studies	Participants	Interventions	Context	Outcomes
Inclusion criteria	- Publications publishes 2000 to present - Any quantitative and qualitative research design - Systematic reviews - Studies examining the efficacy or effectiveness of DIR /Floortime interventions	- Children diagnosed with ASD - Diagnosed by a medical professional - Ages 0-12 years	- Must have a parent-/ peer-involvement component. - DIR/Floortime can be used alongside other interventions - DIR/Floortime Model (is a play-based floor intervention between parent/peer and child)	- Studies conducted in majority world countries	- Any symptoms related to ASD
Exclusion criteria	- Theses/ dissertation - Non-English publications - Unpublished literature	- Children not diagnosed with developmental delays by a medical professional - Children not diagnosed with ASD - Children not diagnosed by a medical professional - Children over the pre-adolescent age range	- Does not have a parent-/ peer-involvement component - Non-DIR/Floortime Model (is not play-based floor intervention between parent/peer and child)	- Studies conducted in minority world countries	- Outcomes not related to ASD

Table 1: Inclusion and exclusion criteria

8.3. Perform literature search

In order to ascertain appropriate publications, only studies found on electronic databases accessible through the Rhodes University Library database or peer-reviewed articles were included in the systematic review. A search of the following electronic databases was conducted:

- Google Scholar
- PubMed
- EBSCOhost PsychArticles
- EBSCOhost Research Databases

- PsychINFO

The following combinations of keywords were found to generate the best search results:

- DIR AND floortime AND autism
- DIR AND floortime AND ASD
- Developmental, Individual-Difference, Relationship-Based Model AND floortime AND autism
- Developmental, Individual-Difference, Relationship-Based Model AND floortime AND ASD
- DIR/floortime AND autism
- DIR/floortime AND ASD
- Developmental, Individual-Difference, Relationship-Based Model/floortime AND autism
- Developmental, Individual-Difference, Relationship-Based Model/floortime AND ASD
- autism AND intervention/therapy AND children
- ASD AND intervention/therapy AND children
- Floortime AND children

Using multiple sets of keywords across various electronic databases increased the specificity and sensitivity of this systematic review (Petticrew & Roberts, 2006). The results of each combination of keywords and database searches are documented in the appendices (Appendix B). Only the first 100 articles per keyword search on each database were analysed during the data collection process, as this ensures specificity in results of the search because the database will post the most relevant articles first and will decrease in relevance after each search page. When searching the Google Scholar database, 10 results were shown per page, meaning, only the papers found on the first 10 pages of the database search were put through the selection process. Searches of the PubMed, EBSCOhost PsychArticles, EBSCOhost Research Databases and PsychINFO databases found less than 100 results per database and keyword search, and thus all papers found were analysed to find possible studies for inclusion. The electronic database keyword searched generated a total of 18 965 outputs. These papers were immediately put through a rigours screening process to determine whether they adhered to all the inclusion criteria and could be accepted for inclusion in the systematic review.

8.4. Screen the search results

The screening process of the results depends on the specific eligibility criteria laid out for the systematic review. In order to ensure that all potentially relevant studies are identified, these eligibility criteria were only loosely applied at the beginning of the data search. The first phase of the screening process involves screening the papers according to their titles, looking specifically at the intervention and the context.

Interventions: Studies that examine the efficacy or effectiveness of DIR/Floortime interventions.

Context: Studies conducted in majority world countries.

Only those studies that unmistakably met the exclusion criteria for the systematic review were excluded from the outset. If it was unclear whether a paper should be excluded, the first and second phase were combined so that a more detailed examination of the abstract could be conducted to determine their eligibility (Meline, 2006). A total of 135 papers were identified during the first phase of the screening process. Four papers were removed because they were not available in English and a further three were excluded for not being freely available on the electronic databases listed above. Furthermore, 112 articles were excluded for being duplicates, bringing the pool down to 16 papers. In the next phase of the process, the abstracts were analysed according to all inclusion and exclusion criteria, after which only 13 studies remained, two of which are systematic reviews of similar topics. Both systematic reviews were excluded after their reference lists were analysed to ensure that no relevant papers were missed during the database search. These papers were excluded because they did not specifically focus on majority world countries, leaving 11 studies for final scrutiny. This data collection procedure was tracked and recorded in the appendices (Appendix B).

8.5. Evaluate the quality of included studies

The process of critically appraising a study is necessary to identify the potential strengths and weaknesses that may be present. This process enables the researcher to determine the study's trustworthiness, usefulness and validity (Solomon & Young, 2009). The remaining 11 studies were evaluated in full, based on whether they answer the research question, i.e. whether they examine the efficacy or effectiveness of DIR/Floortime as an intervention for pre-adolescent children diagnosed with ASD. The inclusion and exclusion criteria were used to ensure that the following papers were assessed in an unbiased fashion (Petticrew & Roberts, 2006). After further examination, it was established that a further three papers did not meet all the inclusion

criteria. One was excluded because although it discusses child-centred play therapy as an intervention for autistic children, it makes no exact reference to either DIR or Floortime. The second and third studies were excluded because although they implement the DIR/Floortime intervention, there was no parent involvement aspect in either of the studies. Thereafter, only 8 papers were identified as meeting all the inclusion and none of the exclusion criteria, making them eligible for inclusion in the systematic review (Appendix C). The studies were evaluated through the use of a data extraction form (Appendix D), which was done to guarantee the systematic examination and summary of the research papers (Petticrew & Roberts, 2006).

The quality of papers was ensured by only including peer-reviewed articles obtained from accredited research databases. However, papers were not judged according to their quality, but rather according to their adherence to the inclusion and exclusion criteria, as doing so could lead to researcher bias (Petticrew & Roberts, 2006). The study design, sample characteristics, measures used, results and limitations of each study were documented in Appendix E to ensure that the interpretation process was conducted in a transparent manner. The papers were also evaluated according to whether or how well they answer the research question. The study designs, statistical methods and methodology were also analysed, so each study could be categorised as having either a low, medium or high study quality (Appendix E). This was done to ensure that the conclusions drawn in the studies are reasonable and based on the data found (Solomon & Young, 2009).

8.6. Synthesise the evidence and disseminate the findings

The selected studies were combined using narrative synthesis, which Arai et al. (2006) break down into three simple steps:

1. *Develop a theory:*

   According to The National Research Council (2001) of America, children diagnosed with autism spectrum disorders should receive intensive interventions that last between 15 and 25 hours per week and should ideally be implemented before the child turns 5 years old. The goals of an intervention should be to improve the child's language, motor, sensory, cognitive and spatial capacities. But in most majority world countries, finding available and effective treatment interventions is difficult. The provision of intensive interventions is not possible for most families due to a lack of healthcare professionals with adequate training and time to support and provide treatment, and those that are intensive are too expensive and often burden the parents (Ho & Lin, 2019;

Chen et al., 2014; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012). However, with DIR/Floortime being a parent-led intervention, it may be the most appropriate and easily accessible intervention for majority world countries.

Furthermore, this model is focused on the child's emotions because Greenspan and Wieder (2003) believe these to be the foundation for all development and learning and enable a child's brain to build and improve their levels of intellectual, social and emotional capacities. Thus, researchers believe DIR/Floortime to work because it "examines the functional developmental capacities of children in the context of their unique biologically based processing profile and their family relationships and interactive patterns" (Greenspan & Wieder, 2003, p. 426), meaning the programme can be tailored towards helping each child improve its ability to function across all developmental capacities that they may be struggling with (Ho & Lin, 2019; Chen et al., 2014). This treatment moves beyond merely trying to change the disruptive behaviours of autistic children and instead moves towards analysing all facets of a person, as they behave in social interactions, looking closely at the communications and exchanges with their caregivers (Aali, Abdekhodaei, Chamanabad, Moharreri, & Yazdi, 2014).

2. *Preliminary synthesis:*
   The papers have been systematically synthesised using a data extraction form (Appendix D, E), which ensures the systematic and uniform summarising of relevant information.

3. *Synthesise the findings within and between studies:*
   All papers selected for the systematic review were summarised descriptively in Appendix E. Conducting a meta-analysis was explicitly not an aim of this descriptive narrative and qualitative review but nevertheless it was not possible to conduct a meta-analysis on the data as the varying study designs and quality of data, found in the papers, meant the results found in the studies could not be pooled.

Disseminating the findings is the most important part of the systematic review (Petticrew & Roberts, 2006). These findings were informed by the completed data extraction forms in the appendices (Appendix E) and were employed to provide an evaluation of using DIR/Floortime

interventions in majority world countries, where access to healthcare and medical professionals, with training in Autism Spectrum Disorders, is limited. The narrative synthesis of the included papers might afford some insight into whether DIR/Floortime intervention is an effective intervention for majority world countries.

8.7. Showing ethical consideration

The purpose of this paper was to systematically review the research that examines the efficacy and effectiveness of the DIR/Floortime intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries. This is considered low-risk research as it reviews peer reviewed and publicly accessible studies rather than collecting personal information from human participants and thus, does not require ethical clearance. An ethical standards query review for this study has been submitted to the Research Projects Ethics Review Committee (RPERC) for the department to validate that no further ethical clearance is required.

8.8. Ensuring trustworthiness and integrity

Systematic reviews are known for having a strong methodology, and by following it strictly, the possibility for researcher bias is minimised (Petticrew & Roberts, 2008). This has been ensured by clearly defining the inclusion and exclusion criteria a priori and strictly adhering to them when conducting the screening process and engaging with the research (Meline, 2006). The form found in Appendix D was used for data extraction to document the data generation and interpretation procedure clearly. Doing so has increased the trustworthiness and integrity of this systematic review by enhancing the possibility of replication. The trustworthiness and integrity of this systematic review was furthermore established using the following criteria laid out by Guba (as cited in Shenton, 2004):

1. Credibility
2. Transferability
3. Dependability
4. Confirmability

Credibility was addressed through the use of triangulation (Guba, as cited in Shenton, 2004). This process involved consulting a wide collection of recognised electronic databases to identify peer-reviewed research studies of varying quality and designs. Triangulating information found across all these sources ensured that no gaps in the evidence base occurred

(Petticrew & Roberts, 2006). The transferability of the study could not be guaranteed because one cannot know who might want to transfer the results and to which context this would be done. However, in order to make it easier for other researchers to make this judgement, thick descriptions of the descriptive data and research context were provided (Shenton, 2004) (Appendix E). Dependability was achieved by ensuring that the methodological steps are logical and described in detail. These steps were strictly adhered to and well documented to allow the study to be easily repeated (Petticrew & Roberts, 2006). Establishing the confirmability of the studies was only possible once their credibility, transferability and dependability had been realised. The confirmability criterion was fulfilled by documenting the narrative synthesis process. This includes demonstrating that the eligibility criteria have been strictly adhered to and that the results of the study are derived from the data and not due to preferences and preconceptions of the researcher. By doing this, the risk of possible selection and researcher bias has been reduced (Shenton, 2004). Finally, because the research is done under supervision, a second 'researcher' contributed to this validation process.

9. Results

This systematic review aims to examine how effective and efficacious Developmental, Individual-Difference, Relationship-Based Model (DIR)/Floortime is as an intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries. In this section, results are presented first under the headings of study characteristics, participant characteristics, types of interventions, outcome measures used, and critical appraisal of studies. The section concludes with a discussion of effectiveness vs. efficacy, socio-emotional development, adaptive functioning, parent engagement, parent satisfaction, intervention intensity, critical appraisal of studies, and adverse events and will reflect on the data in relation to the research question.

9.1. Study characteristics

As shown in Appendix C, the eight papers selected for inclusion were published between 2011 and 2019. The list of studies consists of four pre/post-tests, two randomised control studies, one single group design, and one quasi experimental design. Consistent with the inclusion criteria of the sample, of these, four were conducted in Thailand, two in Taiwan, one in Iran, and one in India. None of the studies found were conducted in Africa which shows how limited the ASD and DIR/Floortime research is within the African context.

9.2. Participant characteristics

The diagnostic measures used across the studies varied, but most of them used the Diagnostic and Statistical Manual of Mental Disorders to establish a diagnosis. One study used the Indian Scale of Assessment of Autism (ISAA) (Kumar, Nizamie, Panda, & Pandey, 2019) and two did not list the measure used, only that a psychiatrist or psychologist conducted the diagnosis (Aali et al., 2014; Jiawiwatkul, Kleebpung, Nopmaneejumruslers, & Yuwapoom, 2017). The reported diagnoses were children with autism spectrum disorder, autism, developmental delays and pervasive developmental disorder not otherwise specified. As shown in Appendix E, the participants' ages ranged between 22 months and 12 years and the age at which the interventions were implemented varies widely. It was occasionally difficult to establish the exact age that some children started the intervention as only their age in years was given, and not the months. All children participating were diagnosed by a medical professional. Symptom severity was reported on in five of the eight studies and ranged from mild to severe, with three studies including participants diagnosed with mild to severe ASD (Hongsanguansri et al., 2018; Nopmaneejumruslers & Pajareya, 2011; Ho & Lin, 2019), one study with children ranging from mild to moderate (Chen et al., 2014), and one study including a child in the moderate range (Kumar et al., 2019). However, inconsistencies were found with regards to the methods used to measure the symptom severity. The study sample sizes ranged from 1 to 45 participants with half the studies having small sample sizes of one (Kumar et al., 2019), six (Jiawiwatkul et al., 2017), eleven (Chen et al., 2014), and twelve (Aali et al., 2014).

In line with the inclusion criteria of this systematic review, all included studies were conducted in majority world countries, but they varied with regards to location, culture, and socioeconomic position. Many studies acknowledged the influence that these factors can have on study outcomes and findings. For example, Nopmaneejumruslers and Pajareya (2012) and Chen et al. (2014) found that many caregivers did not know how to interact and play with their children before the programmes started and stated that it was likely due to the Thai and Chinese cultures, respectively, where the relationships between caregivers and their children are impacted by the hierarchical structure found in traditional Asian families, which values control rather than care. Comparatively, the study conducted by Hongsanguansri et al. (2018) showed that caregivers generally had a positive attitude towards the intervention and its outcomes, knew a significant amount about the model, and were committed to participating in the intervention.

According to Hongsanguansri et al. (2018), the socioeconomic position of caregivers can have an impact on the effectiveness of the DIR/Floortime intervention as this may influence the amount of time caregivers spend with their children implementing the intervention. These researchers reported that the families, participating in their study, were relatively evenly distributed between the low- and high-income brackets. Two studies reported their participants falling within the middle- to high-income bracket (Ho & Lin, 2019; Kumar et al., 2019) and only one study included caregivers in the low- to middle-income bracket (Jiawiwatkul et al., 2017). Many studies, however, did not report on the level of income, but rather on the caregiver's level of education. These studies showed caregivers having a higher level of education. Approximately 80% of caregivers in the studies by Nopmaneejumruslers and Pajareya (2011, 2012), 72.7% of caregivers in the study by Chen et al. (2014), and 75% of caregivers in the study by Ho and Lin (2019) had at least a bachelor's degree. One study only reported that all caregivers in the intervention had similar education levels, but did not report what this education level was (Aali et al., 2014).

9.3. Types of interventions

Comparison of the studies was difficult to implement due to their differences in procedures. Five of the studies made use of the DIR/Floortime Model and followed all the steps for the intervention (Chen et al., 2014; Ho & Lin, 2019; Hongsanguansri et al., 2018; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012), while three of the studies only used the model as a guideline and developed their own interventions using the principles of the DIR/Floortime Model (Kumar et al., 2019; Aali et al., 2014; Jiawiwatkul et al., 2017). One study, by Kumar et al. (2019), incorporated Indian Ragas into the therapy sessions. The duration of the interventions varied significantly, ranging from 6 weeks to 92 months. Five of the studies were short-term studies of 6 (n = 1), 10 (n = 1), 14 (n = 1), and 15 (n = 2) weeks, and two long-term studies: 5 months (n = 1) and 1 year (n = 1). One of the eight studies reported a significant variation in duration ranging from 1 to 96 months of the intervention (Hongsanguansri et al., 2018). Besides the variations in intervention duration, there was also a substantial variation in the number of hours per week spent administering the intervention. It was difficult to estimate the number of hours spent conducting the intervention as researchers did not report on this and instead requested that the caregivers report on the total hours a week. Most of them reported only a general number of hours per child or a general overall number of hours, making it impossible to compare the individual results of participants with the amount of time spent doing the intervention. In one instance, it was clear that the

variation between participants was considerable, with some children doing only 40 hours in total while others did approximately 4 000 hours (Hongsanguansri et al., 2018). Furthermore, according to The National Research Council (2001) of America, children diagnosed with autism spectrum disorders should receive intensive interventions that last between 15 and 25 hours per week; however, only three of the eight studies met the recommended hours per week for the intervention (Ho & Lin, 2019; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012).

All studies included a parent-involvement component to the intervention as this was an inclusion criterion. Five of the eight studies included a formal training course for the caregivers of the study participants, teaching them how to implement the DIR/Floortime intervention method correctly. In the Ho and Lin (2019) study, the parents of the study participants had to complete a three-week DIR training course, followed by an 11-week program at home, where parents recorded their interactions. Similarly, Nopmaneejumruslers and Pajareya (2011, 2012) included a one-day training session for the parents of the study participants, followed by multiple one-on-one sessions to teach them how to implement the intervention and the various techniques that can be used throughout. Following the training, caregivers were asked to record their caregiver-child interactions so they can be given feedback regarding their performance. Program administrators never had direct interactions with the study participants. In the study by Chen et al. (2014), mothers also received formal training in a 3-week one-on-one course, but it was more individualised and the goals discussed and determined were focused towards the needs of each child. The length of Jiawiwatkul et al.'s (2017) training was not discussed, but it had a more holistic approach than the other interventions.

In the Kumar et al. (2019) and Hongsanguansri et al. (2018) studies, parent training was not formal, but instead, they implemented the methods of coaching and modelling. The parents would first receive advice from the therapist regarding their parent-child interactions, second, they would watch the therapist implementing the DIR/Floortime intervention, and lastly, parents would model themselves after the therapist's behaviour. The intervention procedure in the Aali et al. (2014) study is not well described and makes no mention of formal training sessions, and it is thus assumed that this was not included in the intervention.

9.4. Outcome measures used

There were significant differences in the outcome measured used in the studies (Appendix E), and the information provided on the measures was not always clear. The assessments used varied widely from study to study and within the studies, with some papers using different tests for the baseline to post-test to follow up, which can lead to illegitimate claims being made about the level of cognitive, social and emotional improvement. To test for social and emotional functioning, the Functional-Emotional Assessment Scale (FEAS) was used the most, with five out of the eight studies conducting the assessment (Aali et al., 2014; Chen et al., 2014; Ho & Lin, 2019; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012). The FEAS is an outcome measure used to determine the level of social and emotional development of a child through observation and by assessing their developmental milestones laid out by Greenspan and Wieder in their DIR/ Floortime model (DeGangi & Greenspan, 2001). Alternative tests used to measure social and emotional development were the Functional Emotional Development Level (FEDL), the Vineland Social Maturity Scale (VSMS), the Social-Emotional Growth Chart (SEGC), and the Functional Emotional Developmental Questionnaire (FEDQ). Both the SEGC and the FEDQ are measure that are, like the FEAS, based on Greenspan and Wieder's developmental levels, but focus more on the social, emotional and intellectual aspects of a child's development. These alternative measures for development were used in six of the studies (Aali et al., 2014; Hongsanguansri et al., 2018; Jiawiwatkul et al., 2017; Kumar et al., 2019; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012).

To test for severity of ASD symptoms, half the studies used the Childhood Autism Rating Scale (CARS) (Ho & Lin, 2019; Hongsanguansri et al., 2018; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012), one study used the Clinical Global Impressions-Severity (CGI-S) and the Clinical Global Impressions-Improvement (CGI-I) (Hongsanguansri et al., 2018), and another used the Indian Scale for Assessment of Autism (ISAA) (Kumar et al., 2019). One study reported on the symptom severity but did not reveal the measure used (Chen et al., 2014) and two studies did not report on symptom severity in any capacity (Aali et al., 2014; Jiawiwatkul et al., 2017).

The studies all used different measures to assess for adaptive, fine-motor and gross-motor functioning capacities pre and post-intervention. The measures used were the Developmental Skills Inventory (DSI) (Jiawiwatkul et al., 2017), the Developmental Screening Test (DST)

(Kumar et al., 2019), the Chinese Version of Psychoeducational Profile (CPEP) (Ho & Lin, 2019), and the Vineland Adaptive Behaviour Scales (VABS) (Chen et al., 2014; Ho & Lin, 2019). The Developmental Functioning Family Assessment Questionnaire (DFFAQ) was used by Ali et al. (2014) to determine and measure the level of the interactions taking place between parent and child. This measure tested for emotional signalling, relationship engagement, communication, and shared attention.

Besides the standard testing of the child's functioning, development and symptom severity, four interventions also included assessments for the caregivers. One study assesses the caregiver's level of depression using the Patient Health Questionnaire (PHQ) (Hongsanguansri et al., 2018), one examines their level of satisfaction with the intervention using a Likert scale (Nopmaneejumruslers & Pajareya, 2012), and two assess the caregiver's level of stress using the Parent Stress Index (PSI) (Chen et al., 2014; Jiawiwatkul et al., 2017). However, seeing as the Patient Health Questionnaire was only administered post-intervention and not pre and post-intervention, it is deemed unnecessary to include its results in the discussion. Although the other two outcome measures are not capable of directly measuring the efficacy and effectiveness of the DIR/Floortime intervention on children diagnosed with ASD, they are capable of representing the mental state and personal satisfaction levels of the caregivers needing to conduct these interventions. It can be assumed that if parent stress levels go down, while their satisfaction rates go up, that they are seeing some level of improvement in their child's functioning.

Positive outcomes were found across outcome measures, but the most noticeable improvements were in the social and emotional development of the study participants, and these results were indicated across various measures and studies. Researchers found statistically significant improvements in social and emotional development on the FEAS measure in five studies (Aali et al., 2014; Chen et al., 2014; Ho & Lin, 2019; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012), the FEDQ in three studies (Aali et al., 2014; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012), and the SEGC in one study (Jiawiwatkul et al., 2017). Improvements in social and emotional development, where significance was not reported on, were found on the FEDL measure in one study (Hongsanguansri et al., 2018). Kumar et al. (2019) reported that they used the VSMS measure, but no post-intervention assessment results were provided. It was, however, described

that the child showed improvement in socio-emotional functioning. Some studies used more than one of the above outcome measures.

Two studies found statistically significant improvements in ASD symptom severity on the CARS measure (Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012). Progress was shown in two more studies using the ISSA, CGI-S and CGI-I, but significance was not reported on (Hongsanguansri et al., 2018; Kumar et al., 2019). In the study by Hongsanguansri et al. (2018), the CGI-S was administered pre-test, and the CGI-I was used post-test to determine the level of improvement in symptoms. Two studies only used the CARS as a measure for symptom severity pre-test, and the measure was not used as a tool to determine improvement post-intervention (Hongsanguansri et al., 2018; Ho & Lin, 2019). Some studies used more than one of the above outcome measures.

Statistically significant improvements in adaptive functioning and general development were found on the VABS in one study (Chen et al., 2014), while another study showed only slight improvements using the same measure (Ho & Lin, 2019). One study used the CPEP-3 and found statistically significant improvements in adaptive behaviours and motor development but found a significant ineffect in the communication development domain (Ho & Lin, 2019). One study used the DSI and found statically significant improvements in personal social, receptive language, and expressive language developments but only half the children showed improvements in gross and fine motor development (Jiawiwatkul et al., 2017). One study used the DST and provided pre-test scores but failed to provide post-test scores. Improvements in fine and gross motor functioning and communication were reported in the form of a case report and not in the form of numbers (Kumar et al., 2019). However, important to note that some studies only provided total scores of a measure, such as the FEAS and the FEDQ, and did not include the results or an analysis of the individual's areas of development in these the measures.

Parents in the study by Nopmaneejumruslers and Pajareya (2012) showed a 91% satisfaction rate with the results of the intervention. PSI scores improved in both studies but only one study showed a statistically significant improvement in parent distress (Jiawiwatkul et al., 2017) and the other showed a statistically significant improvement in the parent-child dysfunctional interaction score (Chen et al., 2014).

Reference:	Aali et al., 2014	Chen et al., 2014	Ho & Lin, 2019	Hongsang-uansri et al., 2018	Jiawiwatkul et al., 2017	Kumar et al., 2019	Nopmaneejum-ruslers & Pajareya, 2011	Nopmaneejum-ruslers & Pajareya, 2012
Outcome measures used:	FEAS FEDQ DFFAQ	FEAS VSMS PSI	FEAS VSMS CARS CPEP	FEDL CARS CGI-S CGI-I PHQ	SEGC DSI PSI	VSMS ISAA DST	FEAS FEDQ CARS	FEAS FEDQ CARS Satisfaction Likert scale

Table 2: Summary of outcome measures used in studies

9.5. Critical appraisal of studies

All included studies displayed some level of methodological weakness. Overall, only two papers conducted a randomised trial, and study participants were not blinded to the intervention groups they were assigned. Many of the included studies were of lower quality designs such as single-subject and single-group designs. That is not to say that these study designs should not be used, but the emphasis here is on evidence-for-practice. Single-subject designs can provide vital information and can help researchers understand the presenting problem. However, studies that examine an intervention need to be of a higher quality because the evidence needs to be transferable and generalisable from the context in which the study was conducted to the broader population (Daly et al., 2006).

Furthermore, all the studies relied heavily on parent's personal reports of the time spent conducting the intervention and the results seen, resulting in the intervention outcomes being less reliable. The small sample sizes of most studies further reduce the reliability of the interventions as it limits the quality of the conclusion's researchers can draw and the trustworthiness of the supposed benefits of the intervention for children diagnosed with ASD (Button et al., 2013). Only a few studies, however, reported any participant dropouts. Nopmaneejumruslers and Pajareya (2012) and Hongsanguansri et al. (2018) are the only researchers that determined their sample sizes using a power calculation to ensure that the Type I and Type II errors are avoided. In other words, six of the eight studies lack adequate sample sizes to ensure that the role of chance is removed. Additionally, the Kumar et al. (2019) study does not have an adequate sample size because they conducted a pre/post-test single subject study and did not report on statistical significance.

Ho and Lin (2019) and Nopmaneejumruslers and Pajareya (2011) were the only researchers that conducted randomised trials, and therefore, all other included studies may have selection bias. Two studies presented with measurement bias, as they did not report on the validity and reliability of the outcome measured that were used to collect the intervention results (Jiawiwatkul et al., 2017; Kumar et al., 2019). Hongsanguansri et al. (2018) commented on the reliability and validity of all outcome measures used, except for the FEDL, where they did not comment on either reliability or validity, and the CGI-I, where they only commented on its reliability.

Moreover, it is possible that the studies by Aali et al. (2014), Chen et al. (2014), Hongsanguansri et al. (2018), Jiawiwatkul et al. (2017), and Kumar et al. (2019) show treatment infidelity and performance bias, as they failed to apply the interventions for a minimum of 15-25 hours a week, as is recommended by The National Research Council (2001) of America. None of these studies stated that they attempted to avoid low hours of intervention implementation and are thus at risk of contaminated results. In an efficacy study, one would ideally want to avoid co-interventions (Higgins, Singal, & Waljee, 2014). However, this is not applicable in the studies of this systematic review as it is deemed unethical to restrict a person, receiving the DIR/Floortime intervention, to only this treatment and deny them access to other treatments that may be equally or more beneficial for the patient.

Finally, these studies do not significantly reflect their applicability to all ASD children but rather reflect their applicability to the male ASD population. One study did not reveal the gender of the research participants (Aali et al., 2014), three studies only include boys in their intervention (Chen et al., 2014; Ho & Lin, 2019; Kumar et al., 2019) and four studies included children of both genders but at a 1:6 ratio of girls to boys (Hongsanguansri et al., 2018, Jiawiwatkul et al., 2017; Nopmaneejumruslers & Pajareya, 2011; Nopmaneejumruslers & Pajareya, 2012). Autism Spectrum Disorders have long been reported as having a higher prevalence in males than in females, and this sex/gender bias has had a significant impact on clinical practice and research, with females being significantly underrepresented in autism research (Auyeung, Baron-Cohen, Chakrabarti, Lai, & Lombardo, 2015).

Due to gendered expectations, girls are typically expected to be kind, social, empathetic and caring, and must therefore show more severe ASD symptoms, like extreme lack of communication and aggressiveness, before being referred for diagnosis (Bauminger, Solomon,

& Rogers, as cited in Goldman, 2013). A stronger focus on males and a bias towards behaviour expectations may be the reason for the inflated prevalence rate of ASD found in males. This can also be linked to the fact that the science behind the disorder has primarily been presented through the male view, as seen the by Extreme Male Theory of Baron-Cohen (Goldman, 2013). Furthermore, it is well-known that a person's interactions with their socio-cultural environment can impact their behaviour, and with the gendered expectations found in society and culture today, its impact on symptoms expression for ASD is going to be different for boys and girls (Auyeung et al., 2015). For example, a boy may come across as being extremely unresponsive while a girl may simply come across as shy. Ultimately, it is these gendered expectations and perceptions that likely cause the gender/sex bias in autism.

10. Analysis and Discussion

The studies included for review have recognised and reported the many strengths of the DIR/Floortime intervention. These benefits include that it can be applied to any culture and setting, it does not require a high level of training, and due to its parent-led and home-based model, it is a relatively inexpensive intervention, which is beneficial for families who cannot afford expensive care. Children diagnosed with ASD need an intervention that is able to target their wide range of difficulties and can cater to the unique symptomology found in each patient. Greenspan and Wieder's model focuses on the developmental, individualised, and relationship-based needs of these children and incorporates all things needed to improve a child's ASD diagnosis and adaptive functioning. At its core, this model focuses on family relationships and interaction while targeting the levels of development that a child is struggling with, in an attempt to improve communication.

With the unique structure of the DIR model and its focus on tailoring the method and goals of the intervention to each child's developmental level and needs, this intervention has gained appeal with caregivers. This model recognises the importance of relationships and the role they play in aiding the development of ASD children's socio-emotional functioning. Because this intervention model places such a strong emphasis on the importance of caregiver-child relationships, all study participants must follow a team approach to ensure that the risk of family stresses is reduced. This intervention requires family participation, including grandparents, parents and siblings, and incorporates daily life into its workings, meaning that the skills learnt can be extremely beneficial and carried over to various social settings outside the study environment.

These studies show that the DIR/Floortime model can help children with ASD develop their adaptive, cognitive, social and emotional functioning and can help them move up the developmental ladder towards new levels, previously believed to be unattainable for these children. However, although there has been an increase in studies conducted examining DIR/Floortime interventions, studies with rigorous and high-quality designs are still in short supply. The findings of this systematic review are limited by the studies strong reliance on parents to report on the child's progress, restricted use of reliable study designs such as randomised control group designs, the considerable variation in the measures used, and a significant risk for researcher bias. Thus, it is necessary for more empirical evidence to be developed that shows the DIR/Floortime Model's effect on social and emotional functioning.

10.1. Effectiveness vs. efficacy

When examining the efficacy of an intervention, one assesses whether it works under ideal and controlled conditions, while effectiveness studies, on the other hand, examine whether the intervention works under more realistic circumstances; i.e. real-world conditions (Ernst, 2006). All studies included for review were efficacy studies examining how efficacious the Developmental, Individual-Difference, Relationship-Based Model (DIR)/Floortime is as an intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries, except one (Aali et al., 2014), which examined the effectiveness of the intervention. Despite their intention to be efficacy studies, they became effectiveness studies through the course of the interventions. Most interventions cannot be strictly defined as either effectiveness or efficacy studies as it is nearly impossible to conduct a pure effectiveness or efficacy study. They are not a dichotomy but should rather be defined as being on a continuum, where they progress from efficacy studies to effectiveness studies through their implementation (Higgins et al., 2014).

Conducting an efficacy study is highly implausible when dealing with children as it is considered unethical to expect them to not seek out other treatment options at the same time, especially in the case of children diagnosed with ASD, where participating in multiple simultaneous interventions is the norm (Goin-Kochel, Mackintosh, & Myers, 2007). It is furthermore difficult to account for some of the confounding variables such as diet, when dealing with Autistic children, as what may work for one child could have the reverse effect for another (Gangat et al., 2017). Additionally, the fact that these interventions are parent-led

and primarily home-based makes it difficult to ensure that parents are adhering to the number of hours required for the intervention, as would be required in an efficacy study (Higgins et al., 2014). Furthermore, the use of the FEAS in an efficacy study is an interesting choice as its scores are used to assess the child's development in their natural home environment. Other outcome measures are more suited to efficacy studies, like for example, the CPEP, which is designed to assess a child in a laboratory setting. But the child's performance on these tests may be lower than when assessments are conducted in the home environment as many children diagnosed with ASD do not adjust well to unfamiliar environments, which may restrict their abilities (Ho & Lin, 2019).

With the fluid nature of these interventions, they automatically turn into effectiveness studies, rather than efficacy studies, because the participants are removed from a clinical setting and placed into the real world and their private home. The method of this intervention is thus, more experiential and not rigid enough to be categorised as efficacy studies. Although it may have been the original intention for the studies to be efficacy studies, they become effectiveness studies through their integration into the child's home life. On the one hand, its inability to be performed in an efficacy study is a limitation, but on the other hand, it is the opposite. Conducting an efficacy study is the most effective means of observing whether an intervention effect exists, however, it does not allow one to observe the intervention's effect in the real world, where things are not perfect, and participant and system factors have an impact on the intervention outcome (Ernst, 2006). This is especially necessary in the case of testing interventions aimed at improving the functioning of autistic children as no two autistic children are the same, not in symptom presentation, nor symptom severity (Gangat et al., 2017). Efficacy studies are not possible because one cannot account for the extreme variations found in these factors.

10.2. Socio-emotional development

The findings of this systematic review are consistent with the goals of the DIR/Floortime Model. It is important that researchers start taking a more developmental approach to treatments of Autism Spectrum Disorders. It is often the case where evidence-based practices are applied to children with the thought that autism is simply a static condition, but this is not the case because children with autism change as they grow and mature, as all children do. They may not have any knowledge about language or show any interest in people or in interacting with them, which is why they have very different needs compared to those children who have

already developed the capacity to communicate with others, and to use words and symbols (Greenspan & Wieder, 2003). ASD children have different requirements for learning and are on an entirely different level to typically developing children, which is why Greenspan and Wieder (2001) believe it is necessary to start thinking of socio-emotional growth as a normal part of brain development. One can teach an autistic child their colours and letters, but without the capacity to be social and express their emotions, they will struggle immensely in life. The DIR/Floortime intervention focuses on this part of development (Greenspan & Wieder, 2003) and results from the studies show that their social and emotional functioning can be significantly improved, as measured by the Functional-Emotional Assessment Scale (FEAS), the Functional Emotional Development Level (FEDL), the Social-Emotional Growth Chart (SEGC), and the Functional Emotional Developmental Questionnaire (FEDQ).

The focus of the DIR/Floortime model is on functional emotional development, and the outcomes of these interventions are consistent with that focus and with the results of previous studies. Greenspan and Wieder (2006) hold the fundamental assumption that the child's emotions are the foundation for all development and learning, and enable a child's brain to build and improve their levels of intellectual, social and emotional capacities, such as motor, language, visual-spatial and cognition development. Consistent with the results of previous studies conducted in America (Mahoney et al., 2014; Bruckman et al., 2007), this systematic review found significant improvements in socio-emotional functioning and these positive results suggest that interventions focused on the unique developmental capacities, individual differences, and relationships can have a meaningful effect on the socio-emotional development of ASD children. Furthermore, by including parent training into the intervention, caregivers can learn to improve their interaction skills and how to respond effectively, which encourages their children to engage in behaviours that will increase their socio-emotional functioning.

10.3. Adaptive functioning

Half the studies only focus on the social and emotional development of the participants and fail to recognise and acknowledge the importance of the other developmental areas that the intervention aims to improve, which is a significant shortfall of these studies. The DIR/Floortime model does not only seek to improve the socio-emotional development of autistic children but their adaptive functioning, fine and gross motor skills, and language abilities as well (Greenspan & Wieder, 2003). Though children are taught skills that work in

an intervention setting, they also learn some that can be generalised across settings, which is vitally important for children diagnosed with ASD due to their cognitive difficulties related to generalisation. Improvements in communication abilities, daily living skills, and socialisation are essential elements of successful real-world living (Greenspan & Wieder, 2006).

This review shows that the DIR/Floortime intervention can lead to significant improvement in adaptive functioning. Most studies found that the intervention improved fine and gross motor skills, but this development appears to be linked with intervention intensity, with longer studies having higher levels of improvement and shorter studies showing less improvement (Chen et al., 2014; Ho & Lin, 2019; Jiawiwatkul et al., 2017; Kumar et al., 2019). These findings, however, were inconsistent with the findings of a previous study conducted in America, where children showed little to no improvements in motor functioning, despite the intensive intervention period of 1 year (Mahoney et al., 2014). This inconsistency can likely be attributed to the lower baseline scores found in the previous studies, meaning they had more space for improvement. Significant improvements in language and communication were found in all studies, except one (Ho & Lin, 2019), and were not limited by intervention intensity. Children learnt receptive and expressive language at an incredible rate, with the boy in the single-subject study showing improvements after only 3-weeks of intervention. It is incredibly important for an intervention to focus on adaptive functioning development as this can improve the child's functioning in environments, such as school and home. The participants' lack of improvement in one study is inconsistent with the findings of previous research (Bruckman et al., 2007; Mahoney et al., 2014) and with the findings of other studies in this review. This can likely be attributed to the fact that Ho and Lin's (2019) study participants had higher baseline scores, making it difficult to improve their motor functioning over a short period.

10.4. Parent engagement

Parent engagement is a vital part of the DIR/Floortime intervention, and the level of engagement can have a significant impact on the intervention outcomes and the child's overall development (Greenspan & Wieder, 2003). It was found that many factors can impact the outcomes of the DIR/Floortime interventions, especially those related to the parents, such as knowledge of the intervention, child's symptom severity, culture, stress and low socio-economic status. The studies conducted in the eastern context showed that many caregivers reported having little knowledge about how to best engage and interact with their children before the start of the intervention. These findings differ from a previous study conducted in

America by Bruckman et al. (2007), which found that the majority of caregivers in their intervention knew how to interact and engage with their children pre-test and that they successfully did this in a contingent and reciprocal manner. This difference in parental-engagement is likely attributed to the beliefs of study participants in this review, which follow the cultural and societal beliefs that children are meant to obey orders, be seen and not heard, and should be controlled and taught. Such views of a hierarchy within the family are especially present in Thai and Chinese culture (Nopmaneejumruslers & Pajareya, 2012; Chen et al., 2014), but are also present in the African culture. Post-training and intervention, however, these caregivers reported a significant improvement in their caregiver-child interactions and communication, which are primary issues dealt with in the training sessions. It was found that the children of parents with low engagement, due to culture, before the start of the study, showed significantly greater improvement in their development compared to children of caregivers who had good parental engagement from the start. This can likely be attributed to the fact that these caregivers had more space for improvement once they received the training they needed. These findings show that it may be possible to successfully implement this intervention within a South African context due to the similarities between the African and Asian cultures with regards to a hierarchical family structure.

Furthermore, it was established that a parents' lack of knowledge regarding the intervention can have a significant impact on their level of engagement with it and subsequently, their child's level of improvement. Caregivers who felt less sure about the intervention and its workings had greater difficulty implementing the intervention at home, and those who received formal training in the DIR/Floortime model felt more competent in being able to help their children, compared with parents who did not receive formal training. Consistent with previous research conducted in Canada and America, it was found that higher engagement and improvement in engagement skills correlate with higher FEAS, CGI-I and FEDL scores (Casenhiser et al., 2011; Mahoney et al., 2014). There is significant research that supports the importance of having a strong parent-child relationship and the value that such interventions have in moving ASD children along the developmental ladder (Greenspan & Wieder, 1999; Mahoney & Perales, 2005; Nopmaneejumruslers & Pajareya, 2012; Nopmaneejumruslers & Pajareya, 2011; Bruckman et al., 2007; Chen et al., 2014; Hongsanguansri et al., 2018).

Moreover, it was found that a caregiver's socio-economic status influences their parental-engagement in the intervention. According to Hongsanguansri et al. (2018), the socio-

economic position of parents can have an impact on the effectiveness of the DIR/Floortime intervention as this may influence the amount of time parents spend with their children implementing the intervention. Their study found that children who had parents of a lower socio-economic status had greater improvements than children of a higher economic status. However, the other three studies that reported on the socio-economic position of their participants only included participations in one income bracket and all used different outcome measures (Ho & Lin, 2019; Kumar et al., 2019; Jiawiwatkul et al., 2017), meaning their study findings cannot be compared to validate the findings of Hongsanguansri et al.'s (2018) study. In addition, almost all studies included in this systematic review involved caregivers who had bachelor degrees or higher, with only one study including participants with low educational backgrounds. This indicates that the results of these studies are not reflective of all parents living in majority world countries, limiting their generalisability to the overall population. This especially restricts how generalisable these findings are to a South African context, where only 12,1% of the population receives a post-secondary school education (Lehohla, 2016). No alternative literature could be located that examines the effect of income and level of education on the outcome of the DIR/Floortime intervention. This is likely attributable to the fact that most research on ASD is conducted in minority world countries, where income and education and not of particular concern.

10.5. Parent satisfaction

While only one of the eight studies measured parent satisfaction rates as part of the DIR/Floortime intervention, its findings correspond with previous studies conducted in minority world countries. Research by Nopmaneejumruslers and Pajareya (2012) showed a 91% parent satisfaction rate with similar results found in research by Bruckman et al. (2007) that showed a parent satisfaction rate of 90%. Furthermore, Bellini et al. (2005) conducted a survey on 195 parents of children diagnosed with ASD or PDD, aged 2 to 8 years old. Based on the caregivers' responses to the survey, the report concluded that 93.3% of parents found that the intervention was effective and contributed significantly to their child's development and growth. Despite the lack of satisfaction measures conducted in majority world countries, it has been determined that the parents' level of satisfaction is consistent with satisfaction levels found in previous studies. While more studies measuring the satisfaction, in majority world countries, are required before any conclusions can be made on the topic, the results show some promise towards caregivers' positive perceptions of the DIR/Floortime intervention.

10.6. Intervention intensity

Five of the eight studies had a similar intensity and were unable to fulfil the recommended guidelines of performing 15 to 25 hours of the intervention a week (The National Research Council, 2001) and had a shorter study period. These guidelines were established in accordance with the living conditions and culture of minority world countries. Implementing this intervention for so many hours a week is difficult in countries, like South Africa and Thailand, where more often than not the primary caregiver is employed and has longer working hours in comparison to the United States, where these guidelines were developed. Therefore, these factors could be limiting the time caregivers have to engage with and provide attention to their children, leading to a decline in quality of the caregiver-child relationship (Kluwer, Roeters, & Van Der Lippe, 2010). Furthermore, in countries where access to appropriate healthcare professionals is limited, caregivers will choose to participate in as many simultaneous interventions as possible, in an attempt to receive the help they need. This will further limit the amount of time they have to engage in each intervention (Goin-Kochel et al., 2007).

Despite the lower than suggested hours of implementation, most children across the studies showed significant improvement in their socio-emotional development and communication. These findings were consistent with the findings of previous research by Bruckman et al. (2007) and Mahoney et al. (2014), despite the significantly shorter intervention period. This appears to primarily be due to the lower baseline scores of the participants from majority world countries, which are likely a result of the lack of effective and appropriate interventions available in these countries, and the different parent-engagement methods used in traditional Asian cultures. The positive results found in this review show that it is possible to successfully implement this intervention within majority world countries, like South Africa, that may lack resources and time to implement some of the most effective interventions for ASD.

10.7. Critical appraisal of studies

As states previously in this review, few of the studies included had a sound methodology. With the inability to ensure that the efficacy studies would not turn into effectiveness studies through their home-based implementation, it would have been necessary for researchers to use study designs of high quality, with control groups, in order to account for the possible effect of confounding variables. For example, it was not possible to account for variations in the family environment, developmental maturation, and parental engagement. Furthermore, the lack of randomised trials and recruitment methods can have a significant effect on selection bias,

limiting how trustworthy the results of these interventions are (Button et al., 2013). Most participants were recruited through convenience sampling or from clinics and early intervention centres, that they were already attending, which means participants would have needed to have the funds to be part of an existing intervention in order to find out about these studies. This level of selection bias likely led to the exclusion of some of the population and could be the reason for the majority of participants being in the middle to high education or income brackets.

All studies, except two, reported that their participants were receiving support through clinical methods, such as music, occupational, and speech therapy, and other routine care, such as pre-school curriculums or specialised school. Researchers of these studies and existing literature (Casenhiser et al., 2011; Bruckman et al., 2007) failed to control for these factors and their potential impact on the intervention outcomes. This makes it impossible to determine whether the improvements made in the interventions are due to the intervention effect or due to one of the other co-interventions. However, it is considered unethical to force participants to stop alternative treatments like therapy and specialised programmes and to deny them access to potentially life-changing therapies for the entire duration of the intervention. Therefore, although the inability to control for these factors leads to decreased validity of the intervention, the researchers ensure that the ethical reliability of their intervention is sustained.

Although the DIR/Floortime intervention has shown significant promise through the results found across studies, this research and its outcomes are limited by inconsistent study intensities, small sample sizes, low quality study designs, and an absence of replicated studies. Furthermore, the studies found were limited to Asian countries, with their unique cultural practices and beliefs potentially impacting the study results. Therefore, the results of the study will only be generalisable to those majority world countries that follow the Asian culture. However, it may be possible to generalise these findings to a South African context due to some similarities between the Asian and African cultures, but this would need to be done with the utmost care. In order to increase the credibility and generalisability of these study's findings, more high-quality research needs to be conducted in more cultural, ethnic, and economic diverse communities with large sample sizes, set intervention intensities, use of appropriate outcome measures, more detailed descriptions of study results, and stricter adherence to the programmes.

10.8. Adverse events

It is possible that the demanding schedule of the intervention it can lead to some harmful effects for parents and children or may lead to certain family interests being ignored to try and keep up with the study requirements. This is why this intervention is only recommended for those families that have the time, are willing, and motivated to spend multiple hours a day engaging in Floortime activities with their children. Furthermore, a child may experience indirect harm due to participation in an intervention that was found to be ineffective or rejection from an intervention that had a high success rate. However, neither of these harms or risks were reported in the presenting studies.

Based on the finding of the included studies, the DIR/Floortime intervention has no reported adverse effects for the families or children living in majority world countries. There appears to be no risk of harm involved because of the parent-based, fluid nature of the intervention and its lack of coercion. Due to the affect diathesis hypothesis, laid out of Greenspan and Wieder (1999), which states that all the child's experiences need to be perceived as enjoyable for developmental growth to occur, there is little risk that a child will experience any harm directly from the DIR/Floortime intervention. It is nevertheless important to note that some studies did report a lack of success for a few participants. This is always likely to occur, regardless of the intervention method used, because of the nature of the disorder. As previously stated in the first section of this systematic review, there is no single treatment for ASD that is accepted by all medical professionals or parents. Each child will differ from the next with regards to symptoms and severity, and thus, there can be no single treatment that works for all (Gangat et al., 2017).

11. Conclusion

The objective of this systematic review was to consult published studies conducted in majority world countries to determine whether DIR/Floortime interventions are effective and efficacious in the treatment of pre-adolescent children diagnosed with Autism Spectrum Disorders. Children diagnosed with this developmental disorder are characterised as having impairments in their communication, social and emotional functioning that are persistent and severe, and typically present with repetitive patterns of behaviour and restricted interests. These difficulties can have a significant impact on their ability to engage in daily activities, such as play and school, causing further mental and emotional problems. Every child diagnosed with ASD has a unique biological profile, with their own sensory, cognitive, and affective abilities

and their individual strengths and weaknesses, which is why it is essential for an intervention to be based on a therapeutic model that recognises the child's uniqueness, rather than placing them into a standardised program based purely on the fact that they share the same diagnosis. The creators of the DIR/Floortime model have developed an intervention that does precisely that.

The research question was answered by analysing and comparing the eight studies included in this review with each other and other existing literature on the topic. Overall, the studies showed positive results in the DIR/Floortime intervention. The participants appeared to improve in socio-emotional development and adaptive functioning, but it is important to note that some of the findings were tied to intervention intensity, where more improvement was seen in longer interventions. Furthermore, it was found that parent-engagement was a critical factor in child development because close familial relationships contribute significantly to the development of social and emotional functioning in children diagnosed with ASD, where children with more parent interactions also experience better socio-emotional development. The findings of this systematic review show that by providing children with a developmental, individual, relationship-based (DIR) intervention, it is possible for these children to reach new heights in their development that were previously thought impossible because of their ASD diagnosis.

The benefits of parent-training include increasing the intensity of the children's intervention, minimising the time spent in medical environments, and reducing medical costs. Parent-training programmes, such DIR/Floortime, ensure that the intensive interventions children need are not restricted by a lack of clinical practitioners or financial conditions; they are an economical and effective way of dealing with the difficulties that children with ASD and their parents face, while using an appropriate theoretical base or intervention approach. These factors are especially important when dealing with families from majority world countries that may lack resources and time to implement some of the most effective interventions for ASD. Parent-involvement is a central aspect of the DIR/Floortime intervention, and thus it is also essential to understand the socio-economic status, culture and education level of study participants, as these may have an impact on study outcomes. General strengths of the intervention were found to be that it acknowledges the uniqueness of each child and the individual characteristics of their disorder, making it possible to tailor the programme to each

child's individual needs, strengths and weaknesses. Situating the intervention in the child's home, where they feel safe, helps them to apply newly learnt skills to other social settings.

While this systematic review focused on majority world countries, it was found that no DIR/Floortime studies have been conducted in Africa, which limits this studies applicability and shows how scarce the ASD and DIR/Floortime research is within this context. It is precisely these resource-poor countries that require affordable parent-led interventions because they are the most accessible for those individuals that lack the resources and time to implement some of the most effective interventions for ASD. Nevertheless, it is clear from this systematic review that the DIR/Floortime is an efficacious and effective intervention for the treatment of ASD, but only in Asian countries. Its applicability is limited to those majority world countries that follow an Asian culture because the studies found and included for review were limited to Asian countries, and with their unique cultural practices and beliefs, this factor could potentially be impacting the study results. Based on the findings of this review, it would be difficult to determine the applicability of the intervention within other majority world countries that do not follow the same culture. It may be possible for the results to be generalised to a South African context because of some similarities found in their cultures, but this too is limited and questionable due to South Africa's lower education levels and higher poverty rates than the participants of included studies. Therefore, more research must be conducted in other majority world countries and low-income and low-education families before determining whether the DIR/Floortime intervention is truly effective and efficacious in all majority world countries.

12. Limitations of this review

There are a number of limitations to this review. Although the research conducted on DIR/Floortime has been shown to have mostly positive results, especially for the efficacy and effectiveness of this intervention on children diagnosed with ASD, the quality of support for this intervention is weak due to the various design flaws found in the studies. Nevertheless, it is necessary to acknowledge that it was impossible to avoid some of the design flaws because of the parent-led and home-based nature of the intervention, where caregivers have full control over how many hours they choose to implement the intervention and how intense they want to make it. Furthermore, this systematic review could be subject to selection and publication bias due to the limited access to papers and the language scope of the researcher. Only English versions of papers were included and only freely accessible published studies were accepted,

excluding papers and theses that may have made a significant contribution towards the understanding of the effectiveness and efficacy of the DIR/Floortime intervention.

Moreover, it is possible that relevant studies were excluded by accident. When conducting extensive searches of many different electronic databases, the sheer amount of research found can lead to important and relevant studies being missed. Finally, when generalising the results of this review to the overall population, it must be done with the utmost care. The overall quality of the studies included was only rated to be a "medium", limiting its generalisability to all population groups in majority world countries. Of the studies found and included, almost all of them primarily included parents from socially advantaged, well-educated backgrounds making it difficult to ascertain whether these positive results would also be found in families from socially disadvantaged and uneducated backgrounds. This review aimed to specifically assess majority world countries because of the disparities found in study results between participants from high- and low-income countries. However, this focus on well-earning or highly educated families limits the results and findings of this systematic review.

13. Future research

There is currently a paucity of research exploring the efficacy and effectiveness of DIR/Floortime interventions in majority word countries which is likely due to these countries having less healthcare access, lower levels of available resources and a lack of funding. More studies need to be conducted in majority world countries, with a focus on families from socially disadvantaged and uneducated backgrounds. This intervention would be ideal for those communities that lack the appropriate funds to pay for effective ASD interventions. By conducting more studies, its efficacy and effectiveness can be established, and these communities can gain access to affordable treatment. Furthermore, future studies should aim to control how often, how long and how intensely the treatment and control group are experiencing the intervention, as currently, the intervention does not account for confounding factors. When the treatment group receives significantly more treatment hours than the control group, it makes it impossible to determine whether the treatment itself caused the differences between groups, because of the confounding variables of treatment type and treatment duration. Researchers need to separate the treatment variable and can do so by ensuring that treatment and control groups are receiving equal frequency of care.

Moreover, researchers need to make more effort in replicating studies in less westernised contexts and communities with lower incomes and education levels. Future research should ensure that the samples are more culturally, ethnically, gender diverse, ensuring its suitability for all. Studies should reflect the ethnic and socio-economic backgrounds of other majority world countries, especially South Africa, as the efficacy and effectiveness of this intervention in a South African context has never been reported on. Finally, future research should focus on the long-term effects and benefits of the DIR/Floortime intervention, which could aid in strengthening its evidence-base.

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* Studies reviewed in this systematic review

15. Appendices

15.1. Appendix A: Classification of Majority World Countries

(United Nations, 2018, p. 142)

Table C
Developing economies by region[a]

Africa		Asia	Latin America and the Caribbean
North Africa	**Southern Africa**	**East Asia**[b]	**Caribbean**
Algeria	Angola	Brunei Darussalam	Bahamas
Egypt	Botswana	Cambodia	Barbados
Libya	Lesotho	China	Belize
Mauritania	Malawi	Fiji	Dominican Republic
Morocco	Mauritius	Hong Kong SAR[c]	Guyana
Sudan	Mozambique	Indonesia	Jamaica
Tunisia	Namibia	Kiribati	Suriname
Central Africa	South Africa	Lao People's Democratic Republic	Trinidad and Tobago
Cameroon	Swaziland	Malaysia	**Mexico and Central America**
Central African Republic	Zambia	Mongolia	Costa Rica
Chad	Zimbabwe	Myanmar	Cuba
Congo	**West Africa**	Papua New Guinea	Dominican Republic
Equatorial Guinea	Benin	Philippines	El Salvador
Gabon	Burkina Faso	Republic of Korea	Guatemala
Sao Tome and Prinicipe	Cabo Verde	Samoa	Haiti
East Africa	Côte d'Ivoire	Singapore	Honduras
Burundi	Gambia (Islamic Republic of the)	Solomon Islands	Mexico
Comoros	Ghana	Taiwan Province of China	Nicaragua
Democratic Republic of the Congo	Guinea	Thailand	Panama
Djibouti	Guinea-Bissau	Timor-Leste	**South America**
Eritrea	Liberia	Vanuatu	Argentina
Ethiopia	Mali	Viet Nam	Bolivia (Plurinational State of)
Kenya	Niger	**South Asia**	Brazil
Madagascar	Nigeria	Afghanistan	Chile
Rwanda	Senegal	Bangladesh	Colombia
Somalia	Sierra Leone	Bhutan	Ecuador
Uganda	Togo	India	Paraguay
United Republic of Tanzania		Iran (Islamic Republic of)	Peru
		Maldives	Uruguay
		Nepal	Venezuela (Bolivarian Republic of)
		Pakistan	
		Sri Lanka	
		Western Asia	
		Bahrain	
		Iraq	
		Israel	
		Jordan	
		Kuwait	
		Lebanon	
		Oman	
		Qatar	
		Saudi Arabia	
		Syrian Arab Republic	
		Turkey	
		United Arab Emirates	
		Yemen	

The above table was used as a guide to identify majority world countries throughout this systematic review. Therefore, majority world countries were considered to be those that were not seen as high-incomes countries or did not have developed economies. The purpose was to investigate whether DIR/Floortime interventions are effective and efficacious in the treatment of pre-adolescent children diagnosed with ASD, living in contexts where access to healthcare is typically limited.

15.2. Appendix B: Literature search and data collection procedure

- DIR AND floortime AND autism
- DIR AND floortime AND ASD
- Developmental, Individual-Difference, Relationship-Based Model AND floortime AND autism
- Developmental, Individual-Difference, Relationship-Based Model AND floortime AND ASD
- DIR/floortime AND autism
- DIR/floortime AND ASD
- Developmental, Individual-Difference, Relationship-Based Model/floortime AND autism
- Developmental, Individual-Difference, Relationship-Based Model/floortime AND ASD
- autism AND intervention/therapy AND children
- ASD AND intervention/therapy AND children
- Floortime AND children

The research was conducted using the below computerised databases:

- Google Scholar
- PubMed
- EBSCOhost PsychArticles
- EBSCOhost Research Databases
- PsychINFO

Keyword search results

DIR AND floortime AND autism (n = 2393)

Google Scholar:	2340
PubMed:	7
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	13
PsychINFO:	33

DIR AND floortime AND ASD (n = 1609)

Google Scholar:	1580
PubMed:	3
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	9
PsychINFO:	17

Developmental, Individual-Difference, Relationship-Based Model AND floortime AND autism (n = 899)

Google Scholar:	888
PubMed:	1
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	3
PsychINFO:	7

Developmental, Individual-Difference, Relationship-Based Model AND floortime AND ASD (n = 892)

Google Scholar:	881
PubMed:	1
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	3
PsychINFO:	7

DIR/floortime AND autism (n = 1347)

Google Scholar:	1300
PubMed:	7
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	10
PsychINFO:	30

DIR/floortime AND ASD (n = 1314)

Google Scholar:	1290
PubMed:	3
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	6
PsychINFO:	15

Developmental, Individual-Difference, Relationship-Based Model/floortime AND autism (n = 2)

Google Scholar:	1
PubMed:	1
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	0
PsychINFO:	0

Developmental, Individual-Difference, Relationship-Based Model/floortime AND ASD (n = 2)

Google Scholar:	1
PubMed:	1
EBSCOhost PsychArticles:	0
EBSCOhost Research Databases:	0
PsychINFO:	0

autism AND intervention/therapy AND children (n = 1136)

Google Scholar:	1010
PubMed:	5
EBSCOhost PsychArticles:	11
EBSCOhost Research Databases:	98

PsychINFO: 12 ASD AND intervention/therapy AND children (n = 1227) Google Scholar: 1180 PubMed: 1 EBSCOhost PsychArticles: 4 EBSCOhost Research Databases: 38 PsychINFO: 4 Floortime AND children (n = 6830) Google Scholar: 6750 PubMed: 11 EBSCOhost PsychArticles: 0 EBSCOhost Research Databases: 21 PsychINFO: 48	
Phase 1: Screening by title and, if necessary, by abstract Papers included: Google Scholar: 77 PubMed: 24 EBSCOhost PsychArticles: 2 EBSCOhost Research Databases: 22 PsychINFO: 10 Total papers identified: 135 Total papers included: 128	Purpose for exclusion: • Studies conducted in minority world countries. • Content not relevant (not DIR/Floortime) • Involves DIR/Floortime but with adolescents or adults Four papers were excluded because they were not available in English and a further three were excluded for not being freely available on the electronic databases.
Remove duplicates Duplicate papers were excluded (n = 112). Total papers: 16	
Phase 2: Screening by abstract, according to all inclusion and exclusion criteria. Total papers: 11	Purpose for exclusion: • Studies conducted in minority world countries. • Two were excluded for being systematic reviews without a focus on majority world countries.
Phase 3: Screening by full-text	Purpose for exclusion: • One was excluded because although it discusses child-centred play therapy as an intervention for autistic children, it makes no exact reference to either DIR or Floortime. • Two were excluded because although they implement the DIR/Floortime intervention, there was no parent involvement aspect.
Final papers that met the inclusion and exclusion criteria: 8	

15.3. Appendix C: Papers selected for inclusion

Reference:	**Geographical location/year published**
Aali, S., Abdekhodaei, M.S., Chamanabad, S.A., Moharreri, F., & Yazdi, S.A.A. (2014). Developing a mixed-family-focused therapy based on integrated human development model and comparing its effectiveness with Floortime play-therapy on the development of children with autism spectrum disorder. *Fundamentals of Mental Health*, *17*(2), 87-97.	Iran 2014
Chen, S., Chen, Y., Hwang, Y., Lee, P., Liao, S., & Lin, L. (2014). Home-based DIR/Floortime™ Intervention Program for Preschool Children with Autism Spectrum Disorders: Preliminary Findings. *Physical & Occupational Therapy in Pediatrics*, *1*(1), 1-12. DOI:10.3109/01942638.2014.918074	Taiwan 2014
Ho, M.H. & Lin, L.Y. (2019). Efficacy of Parent-training Programs for Preschool Children with Autism Spectrum Disorder: A Randomised Controlled Trial. *Research in Autism Spectrum Disorder*, *71*(1), 1-10. DOI: 10.1016/j.rasd.2019.101495	Taiwan 2019
Hongsanguansri, S., Kiatrungrit, K., Nopmaneejumruslers, K., & Praphatthanakunwong, N. (2018). Factors Associated with Parent Engagement in DIR/Floortime for Treatment of Children with Autism Spectrum Disorder. *General Psychiatry*, *31*(1), 1-10. DOI: 10.1136/gpsych-2018-000009	Thailand 2018
Jiawiwatkul, A., Kleebpung, N., Nopmaneejumruslers, K., & Yuwapoom, W. (2017). A Study of the Holistic Approach to the DIR/Floortime Concept: Banlat Hospital, Phetchaburi. *International Journal of Child Development and Mental Health*, *5*(1), 43-54.	Thailand 2017
Kumar, V., Nizamie, S.H., Panda, M.R., & Pandey, P. (2019). A Case Study: Indian Ragas Adjunct to Floor Time Therapy for of a Child with Autism. *The International Journal of Indian Psychology*, *7*(2), 441-446. DOI: 10.25215/0702.053	India 2019
Nopmaneejumruslers, K. & Pajareya, K. (2011). A Pilot Randomised Controlled Trial of DIR/Floortime™ Parent Training Intervention for Pre-school Children with Autistic Spectrum Disorders. *Autism*, *15*(5), 563-577. DOI: 10.1177/1362361310386502	Thailand 2011
Nopmaneejumruslers, K. & Pajareya, K. (2012). A One-Year Prospective Follow-Up Study of DIR/Floortime™ Parent Training Intervention for Pre-school Children with Autistic Spectrum Disorders. *Journal Medical Association Thailand*, *95*(9), 1184-1193.	Thailand 2012

15.4. Appendix D: Data extraction form template

Research question: How effective and efficacious is Developmental, Individual-Difference, Relationship-Based (DIR)/Floortime as an intervention for pre-adolescent children diagnosed with Autism Spectrum Disorders in majority world countries?

	Paper 1.	**Paper 2.**	**…**
Author/s			
Geographical location			
Type of study			
Sample characteristics			
Study length			
Recruitment method			
Study aims			
Measures used			
Intervention alongside other programmes? (Y/N)			
Results			
Limitations			
Additional thoughts			

15.5. Appendix E: Completed data extraction forms

	Paper 1. medium	**Paper 2. medium**
Author/s	Aali et al. (2014)	Chen et al. (2014)
Geographical location	Iran	Taiwan
Type of study	Quasi experimental design → control group	Single group design
Sample characteristics	12 children Ages 3-8 years	11 **boys** 45-69 months old
Study length	5 months	10-weeks 10h/w Average 109.7hrs of intervention
Recruitment method	Were already visiting their special clinic	Fliers in hospital clinic and private clinic
Measures used	DFFAQ FEDQ FEAS	FEAS VABS-II PSI/SF
Intervention alongside other programmes? (Y/N)	Not mentioned	Y: continued routine programs
Results	1. DFFAQ: Improvement in attention and regulation (27%), and logical thinking (16%). 2. FEDQ: Improvement in self-regulation (35%), and attachment and engagement (48%). 3. FEAS: Improvement in self-regulation (15%), attachment and engagement (17%), and two-way communication (27%). No to minimal improvement in control group.	1. Significant improvement in two-way purposeful communication (4.2-5.7), forming relationships (7.4-10.6), behavioural organisation, and problem solving (1.6-2.5) 2. Adaptive functioning improved, especially communication (43.5-48) and daily living skills (52.4-60.7) 3. Mothers perceived positive changes in their parent-child interactions (30-32.6)
Limitations	- Parents were of same socioeconomic background and similar level of education - Control group received normal treatment - Children dropped out	- Single group design so the effects of maturation and other services and supports are not controlled. → no control group - Sample of convenience- may not express attitudes and beliefs of all mothers of children with ASD - Could not control for effects of normal development and confounding factors like family environment, maternal personality traits.
Additional thoughts		- Consistent with results of other studies - Results correspond to Nopmaneejumruslers and Pajareya's studies (interesting due to shorter time period) - Chinese culture: parent-child relationship → hierarchical structure in family. → mothers learnt to interact with children.

	Paper 3. medium	**Paper 4. medium**
Author/s	Ho & Lin (2019)	Hongsanguansri et al. (2018)
Geographical location	Taiwan	Thailand
Type of study	Randomised controlled trial	Pre-post
Sample characteristics	24 preschool boys (12 control/ 12 treatment) Ages 36-58 months	45 parents of children aged 2-12 y. 33 boys 9 girls
Study length	14 weeks Min 15h/w	1 – 96 months Average of 10 h/w
Recruitment method	Recruited from clinics, hospitals and early intervention centres.	Recruited from the National Institute for Child and Family Development.
Measures used	CARS FEAS CPEP VABS	CARS CGI-S PHQ FEDL CGI-I
Intervention alongside other programmes? (Y/N)	N: no intensive interventions Y: could receive their routine care like physical therapy and speech therapy	Y and N: some participants did and others did not.
Results	CARS: 35.2 → not provided Control: 37 → not provided FEAS: 37.8 → 41.6 Control: 31.5 → 27.8 CPEP: only individual scored provided Communication: 30 → 30.3 Motor: 28.8 → 29.2 Adaptive behaviour: 37.8 → 38.2 Control: Communication: 24 → 26.5 Motor: 22.2 → 24.3 Adaptive behaviour: 25.6 → 28.8 VABS: 77.1 → 82.9 Control: 72.6 → 74.2	CARS: 76.2% severe ASD CGI-S: 40% moderate PHQ: post-test scores showed 42% had mild to moderate depression FEDL: showed an increase in socio-emotional development, from 1 → 3 CGI-I: 50% showed overall development 45.2% showed minimal to slight overall improvement.
Limitations	- None mentioned	- Possibility for selection bias - Researchers may have left out some important factors when conducting research, such as treatment expectations and motivation behind treatment.
Additional thoughts	- Similar findings to Nopmaneejumruslers & Pajareya (2011) and Chen et al. (2014)	

	Paper 5. medium	**Paper 6. medium**
Author/s	Jiawiwatkul et al. (2017)	Kumar et al. (2019)
Geographical location	Thailand	India
Type of study	One-group pre-/post-test design	Pre/post-test single subject design
Sample characteristics	6 children (5 boys and 1 girl) Ages 22-55 months	1 boy, age 7
Study length	3months 10 h/w	24 sessions over 6 weeks (4 sessions/week)
Recruitment method	Recruitment through the Child Developmental Promotion Clinic	Parents sought out care
Measures used	SEGC DSI PSI	DST VSMS – Indian adaption ISAA
Intervention alongside other programmes? (Y/N)	Not mentioned	Y: Hindustani ragas were played during the Floortime sessions
Results	Pre-test: - SEGC: 90,7 - DSI: 6/6/ showed delays in RL[2] and EL skills, and 2/6 showed delays in FM and PS skills. - PSI: 91,8 Post-test - SEGC: 112,2 - DSI: 4/6 showed improvement in RL and EL skills, and 3/6 showed improvement in FM and PS skills. - PSI: 77,7	Pre-test: - ISAA: 130 Mid-test: - ISAA: 125 Post-test: - ISAA: 120
Limitations	- None mentioned	- None mentioned
Additional thoughts	- Similar findings to Nopmaneejumruslers & Pajareya (2011)	

[2] RL: receptive language
EL: expressive language
PS: personal social
FM: fine motor

	Paper 7. medium	**Paper 8. medium**
Author/s	Nopmaneejumruslers & Pajareya (2011)	Nopmaneejumruslers & Pajareya (2012)
Geographical location	Thailand	Thailand
Type of study	Pilot randomised controlled trial	Pre-post test
Sample characteristics	32 children (Random assignment based on age and symptom group) Mild: age 24-47m Mild: age 48-72m. Severe: 24-47m Severe: 48-72m Intervention group ratio: 15 boys/1 girl	34 children 2-6y/o 30 boys/4 girls
Study length	3months Min. 15-20h/w	1year 14.2h/w
Recruitment method	Paper, advertising DIR And interested parties could call for registration	Participants of previous study
Measures used	FEAS CARS FEDQ	FEAS CARS FEDQ Satisfaction Likert scale
Intervention alongside other programs? (Y/N)	Y: Intervention group continued with ongoing routine care Control group: normal routine care	Y: Majority participated in other programs simultaneously
Results	1. FEAS: mean from 24.4-31.4 Control: 23.5-25.4 2. CARS: mean from 37.2-34.7 Control: 39.7-38.9 3. FEDQ: mean from 44-51.7 Control: 40.7-41.5	1. FEAS: median from 20.5-28.25 2. CARS: median from 37-34 3. FEDQ: median from 37-48 4. Satisfaction Likert scale: 50% satisfied 41% somewhat 9% dissatisfied
Limitations	- One person dropped out of the study - Involved families that were interested in this new intervention - Varying types of interventions in control group - Varying amount of treatment in treatment group - Results could be partially attributed to more time spent with parents and in intensive intervention - Didn't measure cognitive skillsets, social functioning or school performance. - Didn't measure competing demands. - Difficult to verify parent reports of home application of DIR	- Involved families that were interested in this new intervention. - Varying amount of treatment in treatment group - Results could be partially attributed to more time spent with parents - Didn't measure cognitive skillsets, social functioning or school performance - Didn't measure competing demands - Difficult to verify parent reports of home application of DIR - All materials had to be translated into Thai
Additional thoughts	- Good results → due to lack of appropriate treatments before → parents did not know how to engage with children (Thai culture) Parent perceptions - found it difficult to implement and maintain due to demands of work/other children	Generalisability in question - Parents in study were socially advantages, well-educated - Parents were volunteers and thus more likely to get results from parent training. - Correlation between more hours per week and more improvement