

Occupational therapy interventions in promoting social communication skills among children with autism spectrum disorder: A scoping review

Nurazrina Rhaman, BOT^{1,2}, Padma A Rahman, PhD¹

¹Centre for Occupational Therapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, Selangor, Malaysia, ²Cemerlang Cendana Educational Centre, Selangor, Malaysia

ABSTRACT

Introduction: Children with Autism Spectrum Disorder (ASD) often face significant challenges in verbal communication, social interaction, and exhibit repetitive behavioral patterns. These challenges persist across various developmental stages, particularly impacting their social communication abilities. This scoping review aims to explore the range of occupational therapy interventions that are employed to enhance social communication skills in children with ASD.

Materials and Methods: A literature search was conducted independently on scientific databases: Scopus, Google Scholar, Science Direct, and Web of Science (WOS). The process was carried out according to the PRISMA guidelines.

Result: Of the 195 studies identified, 8 articles involving 185 participants, aged 17 months to 12 years old, across six countries met the inclusion criteria. The majority of studies indicate significant improvement in social communication abilities, while one study demonstrates insignificant results and another study presents mixed outcomes, utilising two different assessment tools.

Conclusion: Occupational therapy has showed promise in improving social communication in children with ASD. Nonetheless, this review emphasises the need for greater in-depth study and long-term evaluation to better explain and sustain these benefits. More research is needed to develop OT interventions that are both effective and evidence-based.

KEYWORDS:

Social communication, autism spectrum disorder, occupational therapy, scoping review

INTRODUCTION

Children diagnosed with autism spectrum disorder (ASD) encounter various challenges, for instance, challenges in social interaction, verbal communication, and behavioural routines that are repetitive.¹ According to the CDC, the prevalence of ASD among 8-year-old children in the US was 1 in 54 in 2016.² Global estimates suggest a greater range of 50 to 70 cases per 10,000 individuals.³ The diagnosis of ASD is significantly more common in boys compared to girls, with

boys being diagnosed at a rate four times higher than girls.^{4,5} In contrast, the available data on ASD prevalence in Malaysia is minimal. However, a preliminary study conducted by the Ministry of Health Malaysia in 2006, using the M-CHAT assessment, found that the incidence of ASD in toddlers was 1.6 per 1,000.⁶

Numerous researchers have revealed that children with ASD face difficulties in behaviour requests, social interaction, as well as shared attention, all of which are critical components of social communication abilities. Children who have ASD are more likely to exhibit those deficits in comparison to normal health children and children with forms of developmental issues. Social communication is one of the common difficulties among children with ASD at all developmental stages.⁷ The difficulties in social communication linked to ASD have a substantial impact on both the children and their parents. Parents frequently face issues in efficiently identifying their children's needs.⁸ These children often encounter challenges in articulating their needs and opinions, particularly in educational settings, resulting in reduced academic achievement and frequent disruptions in peer interactions caused by unrelated interruptions. This issue results in challenging behaviours in school and at home, limiting their opportunity or ability to execute independently in instrumental activities of daily living (IADLs) and activities of daily living (ADLs).

Tomchek et al.⁹ highlight the critical role of occupational therapy (OT) in enhancing involvement in social communication for individuals, with a specific emphasis on its relevance in the context of ASD. Despite the fact that there remains a notable gap in the literature, current reviews do not adequately explore OT interventions aimed at enhancing social communication skills in children with ASD. This shortfall highlights an urgent need for comprehensive research to support the development and refinement of targeted services, thereby advancing our understanding and effectiveness of OT interventions in fostering social communication competencies

MATERIALS AND METHODS

This study is based on the PRISMA Extension for Scoping Review (PRISMA-ScR).¹⁰

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Corresponding Author: Padma A. Rahman

Email: padma553@uitm.edu.my

Table I: Databases and search strategies utilised

Databases	Search strategy January 2022 to April 2022
SCOPUS	TITLE-ABS-KEY (("social communication" OR "social skills" OR "communication skills" OR "social interaction") AND ("occupational therapy" OR "occupational therapy intervention") AND ("autism spectrum disorder" OR "ASD"))
Web of Science (WoS)	("social communication" OR "social skills" OR "communication skills" OR "social interaction") AND ("occupational therapy" OR "occupational therapy intervention") AND ("autism spectrum disorder" OR "ASD")
Science Direct	("social communication" OR "social skills" OR "communication skills" OR "social interaction") AND ("occupational therapy" OR "occupational therapy intervention") AND ("autism spectrum disorder" OR "ASD")
Google Scholar	("social communication" OR "social skills" OR "communication skills" OR "social interaction") AND ("occupational therapy" OR "occupational therapy intervention") AND ("autism spectrum disorder" OR "ASD")

Search Strategy

A comprehensive search of the published literature was conducted on online scientific databases: Science Direct, Google Scholar, Web of Science (WoS), and SCOPUS. The search terms, social communication, occupational therapy, spectrum disorder, and autism, together with the Boolean operators AND, and OR, was utilised across all the reviewed sources. Table I presents the search techniques that were applied across all the databases.

Review Criteria

All publication that met the inclusion criteria was considered. The type of studies included experimental studies, non-randomised control trials randomised control observational studies, case reports, pilot studies, quasi-experimental studies, and other trials. This study falls under levels 2, 3, and 4 of the evidence hierarchy with regards to Oxford Centre for Evidence-Based Medicine.¹¹ Children diagnosed with ASD, below 12-year-old, OT interventions that focus on social communication, research published between 2011 and 2021, full text article and research published in English were the other inclusion criteria.

The Selection of Studies

The screening procedure was carried out after all the papers were entered into Mendeley; duplicates were removed. Aside from eliminating duplicates, we deliberately omitted studies categorised as literature reviews, systematic reviews, or meta-analyses. We conducted this action to concentrate our analysis exclusively on original research articles, ensuring that our study was based on primary research data and findings, rather than on secondary summarises or interpretations. In addition, we eliminated studies that did not include OT interventions. It refers to interventions that are not carried out by occupational therapists (OTs) or are not grounded in the principles of OT. The exclusion was essential in order to precisely concentrate our investigation on the specific influence and function of OT. The titles, abstracts, and full text of the screened articles were reviewed to determine their eligible criteria.¹⁰ To ensure a comprehensive and unbiased initial gathering of literature, no date filter was applied at this stage. This methodology enabled us to incorporate a diverse range of studies, including influential and fundamental research that may have been conducted in the past but remains pertinent.

Extraction and Synthesis of Data

A table for charting data was constructed so that critical information from the articles could be extracted and charted. The following data were extracted: the authors' name, type of study, year of publication, type of intervention, participants' details, study outcomes, type of evaluation, information on the sessions, duration of the intervention, and the intervention managers, main result, main limitations, funding sources, and a declaration of interest. The extracted data was entered into the charting form. Since scoping review aims to give a research's comprehensive overview that was previously conducted regardless of the quality of the evidence, the quality of the studies was not taken into consideration during the review process.¹²

RESULTS

Search Results

Eight intervention studies were included in this review, data were extracted and synthesis. The selection procedure is depicted in PRISMA Flow diagram [Figure 1].

Descriptive Overview of Studies Contained

Table II provides an overview of the included studies. Out of the eight studies, three were conducted in the United States of America (USA), three in Asia (Iran, South Korea, and Taiwan), and two in Europe (Spain and Portugal). All studies were conducted on children diagnosed with ASD. The number of participants in the studies range from three to 43.^{17,19}

Study Design

Three of the studies included were pilot studies,^{13,15,20} three were randomised control trials,^{14,18,19} one was an empirical study, and one was a single-subject design.^{16,17} A control group was only included in three of the experiments that received the usual therapy.^{14,18,19}

Assessment Tools for Social and Communication Skill

A range of assessment tools were employed to examine the social communication issue in children with ASD, where a variety of instruments was used. The assessment tools included were Vineland Adaptive Behaviour Scales (VABS),^{13-15,19,20} Autism Diagnostic Observation Schedule (ADOS),^{15,19} Paediatric Evaluation of Disability Inventory (PEDI),¹⁴ Mullen Scales of Early Learning (MSEL),¹⁰ Bayley Scales of Infant Development,¹⁵ Differential Ability Scales (DAS),¹⁵ Brief Observation of Social Communication Change (BOSCC),¹⁵

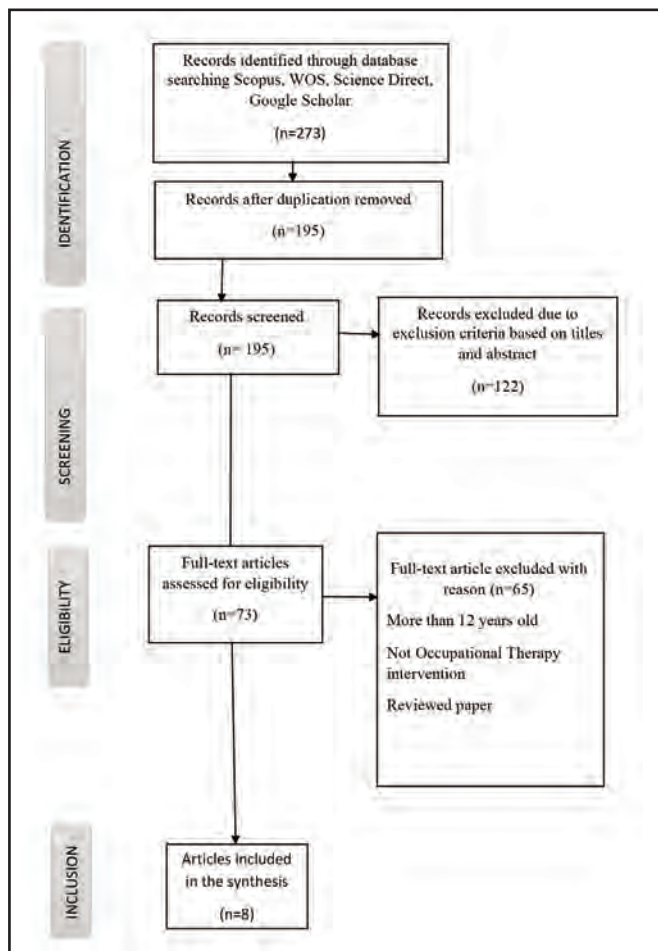


Fig. 1: PRISMA flow diagram

Assessment Scale of Children with ASD Social Communication Dimension,¹⁵ M-CHAT,¹⁷ Evaluation of Social Interaction,¹⁷ and Reynell Developmental Language Scale (RDLS).¹⁹

Types of Intervention

The study results were classified based on the numerous intervention possibilities that were investigated. Notably, three distinct studies^{15,16,20} utilised social skills training as a common intervention method. Two studies^{13,19} explicitly investigated the use of animal-assisted intervention, while another study¹⁷ coupled modifications to the environment with instruction in social skills. In addition, a study examined the effects of sensory integration¹⁴ as well as a combined strategy involving behavioural control and environmental modification¹⁵. The DIRFloortime programmes was utilised as an intervention technique in two of the studies,²⁰.

Outcomes

Most of the articles reported positive outcomes of social communication abilities. However, one study found no significant improvement in social communication skills,¹³ while another study by Swain et al.¹⁵ found mixed results with two different outcome measures, where social communication skills in BOSCC showed more significant improvements than ADOS-2.

Main Limitation of Included Studies

Table IV displays the primary limitation identified by the authors of the included studies, as well as other factors that may impact the interpretation of the obtained outcome. The primary limitation in the included studies is the small sample size, which was documented in five of them. Three studies reported challenges in maintaining ongoing monitoring of treatment responses and skill retention after the intervention, with the ages of the participants ranging from.^{13,14,17,18,20} Furthermore, difficulties were observed in maintaining a consistent approach to administering therapy and utilising reliable tools to assess changes during a 10-week intervention period.¹⁴ While three studies identified limitations in maintaining continuous monitoring of treatment responses and skill retention post-intervention.^{15,18,19} In addition, four studies did not include a control group,^{13,16,17,20} and one study did not properly examine the practicality and acceptability of the proposed models.¹⁵ Furthermore, the studies did not assess whether the benefits of interventions persisted after the intervention ended.¹⁵

DISCUSSION

This scoping review conducted a systematic analysis of data from eight intervention studies to examine the effectiveness of OT interventions in improving social communication skills in children with ASD.

The geographical distribution of the eight studies which covered United States, Asia and Europe suggest as worldwide acknowledgment of the need and interest in social communication intervention. There is a variation of sample size between studies ranging from three to forty-three participants. The inclusion of different type of study such as pilot studies, randomized control trials, an empirical study, and a single-subject design, demonstrates the progressive development of studies in this area.

Despite this diversity, the majority of the studies had an insufficient number of respondents, and the research designs that are considered to be the gold standard, such as randomised controlled clinical trials, were uncommon. This may have been due to the people’s characteristics participating in the research, such as the fact that they were living with conditions or disabilities that had specific or varying effects. Other than that, the setting may have had an influence, as it was not possible to have a large number of participants in rehabilitation or community settings.

A variety of assessment tools are utilised to evaluate social communication issues, including VABS,^{13-15,19,20} ADOS,^{15,19} PEDI,¹⁴ MSEL,¹⁰ Bayley Scales of Infant Development,¹⁵ DAS,¹⁵ BOSCC,¹⁵ Assessment Scale of Children with ASD Social Communication Dimension,¹⁵ M-CHAT,¹⁷ Evaluation of Social Interaction,¹⁷ and RDLS¹⁹ shows the complex and diverse nature of ASD. Other than that, it is also indicates that there is lack of consensus on the most effective method to assess the results of interventions, particularly in relation to social communication skills.

It was noted that in all eight intervention studies, each intervention for social communication focused on a distinct

Table II: Main characteristic of the included studies

Author, Year	Study design	Sample size, country	Participants	Interventional/comparator	Evaluation	Assessment Tools Used	Study Outcomes
Ajzenman et al. (2013) ¹³	Pilot study, single group pre-post design	7, United States	ASD, 4 boys and 3 girls Age: 5- 12 years old	HPOT is an intervention method that makes use of the horse's movement to help individuals achieve functional goals.	Pre and post evaluation Nonparametric statistic Wilcoxon signed-rank	Force Plates and Video Motion Capture to capture centre-of-pressure (COP) and centre-of-mass(COM) Vineland Adaptive Behaviour Scales-II (Parent/Caregiver Rating Form) Child Activity Card Sort	Force Plates and Video Motion Capture are used to evaluate changes in postural control Vineland Adaptive Behaviour Scales-II (Parent/Caregiver Rating Form) is employed to evaluate adaptive behaviour and performance of the children in daily living activities. Child Activity Card Sort to evaluate changes in involvement in everyday activities.
Schaaf et al. (2014) ¹⁴	Randomised control trial	32, United States	ASD, 26 boys and 6 girls Age: 4.0 to 7.11	Manualised OT/SI intervention followed as outline by Jean Ayres.	Pre and post evaluation Two-tailed independent sample t-test Wilcoxon Rank Sum test	Goal attainment scaling (GAS) The Paediatric Evaluation of Disability Inventory (PEDI). Pervasive Developmental Disorders Behaviour Inventory (PDDBI). The Vineland Adaptive Behaviour Scales II (VABS II).	GAS is employed to assess the functional result of parent's claimed individual goal of achievement. PEDI examines a child's mobility, social skills, as well as capacity to take care of themselves and domains of Sensory/Perceptual. PDDBI to assess Ritualistic/Resistance to change as well as Arousal Regulation. VABS II are employed to evaluate participation in school, family, as well as community activities.
Swain et al. (2020) ¹⁵	Pilot study	34, United States	ASD, 27 boys and 7 girls Age: 17 months to 33 months	Augmented naturalistic developmental behavioural intervention	Pre and post evaluation Levene's test Independent sample t-test Generalized Linear Mixed Models (GLMM)	Mullen Scales of Early Learning (MSEL) Bayley Scales of Infant Development. Differential Ability Scales, Second Edition-Early Years (DAS-II). The Autistic Diagnostic Observation Schedule, 2nd Edition (ADOS-2). Brief Observation of Social Communication Change (BOSCC). Vineland Adaptive Behaviour Scales, 2nd and 3rd Editions (VABS II and VABS III) The Measure of NDBI Strategy Implementation-Caregiver Change (MONSI-CC)	MSEL, Bayley Scales of Infant Development, as well as Differential Ability Scales, DAS II to assess cognitive skills and developmental capacities. ADOS-2 is employed to evaluate the severity of a child's autism symptoms. BOSCC to assess improvements in social communications skills. VABS II and VABS III are employed to evaluate the adaptive functioning of children. MONSI-CC used to evaluate the effectiveness and appropriateness of NDBI strategies.
Reis et al. (2018) ¹⁶	Empirical study	25, Portugal	ASD, 17 males and 8 females	DIR Floortime Program	Pre and post evaluation t-test for paired sample	Assessment Scale of Children with ASD. Assessment Scale of Children with ASD to evaluate Social Communication (SC), Repetitive Behaviour and Restricted Interest (RBRI), as well as Sensory Processing (SP), social interaction and sensory regulation.	Assessment Scale of Children with ASD to evaluate Social Communication (SC), Repetitive Behaviour and Restricted Interest (RBRI), as well as Sensory Processing (SP), social interaction and sensory regulation.

Table II: Main characteristic of the included studies

Author, Year	Study design	Sample size, country	Participants	Intervention/comparator	Evaluation	Assessment Tools Used	Study Outcomes
Park et al. (2020) ¹⁷	Single subject design, ABA	3, South Korea	ASD Age: 24 to 36 months	Family-centred early intervention	Pre and post evaluation, follow up phase Linear graph and 2 standard deviation (2SD)	Toddler Autism Modified Checklist, Revised, with Follow-Up (M-CHAT-R/F). Social Interaction Evaluation, 2nd Edition.	M-CHAT-R/F to evaluate infants at risk of ASD. Social Interaction Evaluation, 2nd Edition to evaluate social interaction measures how well a person interacts with others in "actual" situations
Kahjoogh et al. (2020) ¹⁸	Randomized control trial	30, Iran	ASD Age: 4 to 6 years old	Son-Rise program for intervention group while control group received traditional occupational therapy, which includes sensory integration therapy	Baseline Pre and post evaluation Paired t-test Wilcoxon sign ranked test Independent-t test Mann-Whitney	Gilliam autism rating scale (GARS-2). Vineland Social Maturity Scale.	GARS-2 to assess communication skills and social interactions skills. Vineland Social Maturity Scale to assess social developmental age.
Hernández-Espeso et al. (2021) ¹⁹	Randomized control trial	43, Spain	ASD Age: 4 to 5 years old	Dolphin Assisted therapy	Pre and post evaluation Mann-Whitney U-test Wilcoxon test ANOVA	The Autism Diagnostic Observation Schedule-Generic (ADOS-G). The Reynell Developmental Language Scale (RDLs). The Vineland Adaptive Behaviour Scales-Second Edition.	ADOS-G to evaluate communicative and social skills. RDLs to assess comprehensive and expressive language VABS II to assess communication and localization skills
Liao et al. (2014) ²⁰	Pilot study	11, Taiwan	ASD Age: 45 to 69 months	Homebased DIR/Floor time intervention program	Pre and post evaluation Wilcoxon signed-rank.	Functional Emotional Assessment Scale (FEAS) The Vineland Adaptive Behaviour Scales-Second Edition. The Parenting Stress Index-Short Form (PSI/SF; Abidin, 1990)	Functional Emotional Assessment Scale to assess changes in the children's emotional functioning in the context of their connection with their caregiver VABS II to track changes in the children's adaptive behaviours. PSI/SF was employed to evaluate perceptions of stress experienced by mothers.

Table III: Characteristic of the interventions conducted in the included studies

Author, year	Interventions	Duration (w)	Sessions	Intervention managers	Main result
Aizenman et al. (2013) ¹³	Numerous mounted positions, which includes forward sitting (astride), supine, prone, backward sitting (astride), standing, quadruped, kneeling, as well as side sitting. Applying half halts further examined trunk stability and attentional skills, changing speed within the walk, as well as intermittently stopping and starting as respondents followed complicated directions which involves changes in tasks and games, obstacle courses, as well as positioning which requires the use of the upper extremities.	12	Once a week, 45 minutes	OTs	The study found notable improvements in postural control post-HPOT. Significantly, there was a 12% decline in the variability of COP sway area (p = .028), a 102% drop in the mean Anterior-Posterior (AP) velocity of the COM (p = .046), and a 20% reduction in the Medial-Lateral (ML) velocity of the COM (p = .046). Nevertheless, there were no significant differences seen in COP AP and ML velocity, as well as COM sway area variability. Furthermore, there were significant decreases observed in the COM normalised sway area (with a 40% change, p = .046) and sway path length (with a 7% change, p = .028), as well as in the COP normalised sway area (with a 48% change, p = .046) and sway path length (with a 24% change, p = .028). In addition, there were substantial decreases in both mean (33% change, p = .028) and minimum displacement (77% change, p = .028) between COM and COP post-HPOT, with large effect sizes. Researchers revealed statistically significant changes in the overall adaptive behaviour composite score for children with ASD following HPOT, hence having a small effect size. Significant improvements in the receptive communication (p=0.026) content categories of listening, following 2-step instructions, and following if-then instructions were observed (p=0.046). Significant changes in acceptable social caution, notably avoiding harmful behaviours, occurred as a means of coping. There were no significant changes in interpersonal skills, written communication, expressive communication, or time spent playing as well as relaxing. Researchers discovered no significant distinct in domains of daily life as well as motor skills. There is a significant increase in area of self-care (p=0.027), low-demand leisure (p=0.042) and social interaction (p=0.027) post-HPOT.
Schaaf et al. (2014) ¹⁴	Intervention group; Manualised OT/ SI intervention; Usual care group (Control group); Speech and language services, educational program, behavioural interventions as well as other therapies	10	1 hour, Three times per week	OTs	There is a significant difference between the UC and treatment groups on the GAS with the treatment group attaining significantly greater scores (p= 0.003). Both the Self-Care Care-Giver Assistance subtest (p=0.008) including the Social Function Care-Giver Assistance subtest (p= 0.039) show a significantly larger change for the treatment group in comparison to the UC control group. Notably, the treatment group also demonstrated significant advancement on the Self-Care Functional Skills subtest (p=0.28) as well as the Social Functions subtest (p=0.097). Despite changes in the treatment group reached significance in the Sensory Perceptual Behaviours Subscale (p=0.064), there exists no differences in autism behaviours between the groups in the post-treatment stage. There were no significant improvements in adaptive behaviours, despite the fact that the treatment group outperformed the UC Controls across the subscales.

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Table III: Characteristic of the interventions conducted in the included studies

Author, year	Interventions	Duration (w)	Sessions	Intervention managers	Main result
Swain et al. (2020) ¹⁵	Child-focused services is divided to group-based instruction and parent-mediated special instructions. NDBI strategies, which includes choice or child-initiated teaching episodes, broadening of attentional focus, imitation of child language, play, and behaviour, modelling, balanced turns, prompt fading, prompting, natural reinforcement, shared control, environmental arrangement, as well as three-part contingency child were employed for group-based intervention. Caregivers will get 60 minutes of caregiver support group, 60 minutes of psychoeducation group, and 30 minutes of individual visits with a Social Worker as needed for caregiver-focused services.	24	13 hour per week	Board-Certified Behavior Analyst (BCBA), a Special Education Teacher, OT, Social Worker, SLP, PSY, Post-Doctoral Fellows in Psychology, and research assistants.	Children depicted significant improvement in VMA (Verbal mental age)(p<0.001) as well as NVMA (Non-verbal mental age)(p<0.001) of MSEL, BAYLEY and DAS-II. Significant drop in social communication symptoms were noted on the BOSCC (p=0.05). No significant changes in social communication symptoms when assessed by ADOS 2. Significant improvement in age equivalents (AEs) for social skills (p=0.034), daily living skills (p=0.009) as well as communication abilities (p<0.001). Caregivers depicted significant increases in total usage of NDBI strategies employing the MONSI-CC, but only two domain which is show significant changes which is Environmental Set-up (p=0.04) and Child Guided Interaction (p=0.03).
Reis et al. (2018) ¹⁶	The Floortime sessions were managed by a psychologist and aimed at improving joint attention and social interaction between the parents and children. During sensory integration sessions, the therapist employed play activities and sensory-enhanced interactions to evoke the adaptive responses of a child. The therapist designed activities that included the child and developed his or her motor planning and sensory processing skills. The objective of the child's individual speech therapy intervention, which was monitored by Speech Language and Pathologist was to equip the child with pre-symbolic and symbolic communication methods while expanding their communicative intentions to unused pragmatic categories.	40	30 minutes, Once or twice a week	OTs, PSY, SLP	SC dimension had statistically significant differences (p<0.001) with SP (p≤0.001), and RBRI dimension, is not statistically significant.
Park et al. (2020) ¹⁷	Family-centred early intervention programs, which includes task and feedback, play video recording and training, home environment modification, as well as related information training. Tasks were conducted daily, and their responses were recorded in the task notes. The assigned researcher contacted the caregiver via daily messages to verify the assignment's performance.	6	12 times	OTs	There were significant changes in social interaction quality for participants 1 (most noticeable changes were looks, turns toward, produces speech, regulates, as well as replies), participant 2 (most noticeable changes were looks, turns toward, as well as gesticulates), and participant 3 (most noticeable changes were looks, turns toward, gesticulates, regulates, produces speech, questions, as well as replies). The Risk of ASD of M-CHAT-R/F score changed, with Participant 1's score moving from high to middle risk, Participant 2's score moving from high to middle risk, and Participant 3's score moving from high to low risk.

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Table III: Characteristic of the interventions conducted in the included studies

Author, year	Interventions	Duration (w)	Sessions	Intervention managers	Main result
Kahjoogh et al. (2020) ¹⁸	The primary methods of the program were imitating stereotyped movements, responding quickly and naturally to the child's interactive behaviours, communicating with the child, increasing the child's responsiveness, as well as engaging in new activities.	24	45 to 60 minutes per session	OTs	There exists a significant difference between the mean of pre- and post-test raw scores with regards to social interaction ($p < 0.001$) as well as communication ($p = 0.027$) in both groups. As per GARS-2 questionnaire, the reducing mean signifies increase in the social communication and interaction of the study's respondents. There exists a significant difference between the two groups with regards to social interaction ($p = 0.001$), and no significant difference was made with respect to communication ($p = 0.53$). Moreover, social interaction scores reduce in the intervention group, signifying that the intervention possessed a positive impact on social interaction.
Hernández-Espeso et al. (2021) ¹⁹	Intervention Group (DAT) The games were designed employing different materials (for example, numbered diving sticks, frisbees, baskets, balls, as well as colorful rings), so that the children had to utilize both comprehensive and expressive communication skills. The sessions were designed and applied in a similar way for all the children, although individual characteristics were taken into consideration. Activities included: simulating their medical treatment; asking the dolphins questions that could be answered with "yes" or "no"; petting and naming different parts of the dolphin's body; as well as asking the coach for fish and giving it to the dolphins, among others. Control group (TWD): The sessions were similar to the DAT group sessions, but there was also a water component. Children engaged in recreational activities on the pool's edge and in the water, interacting with the therapist and the dolphin trainer. At the end of the session, these children participated in a relaxing water activity.	10	45 minutes, 18 sessions	Dolphin trainer, OTs, PTs, PSY	ADOS-G: Both groups demonstrated a significant improvement in the "Communication" dimension from the pre-test to the post-test ($p < 0.001$). The statistical analysis did not find a significant interaction between the variables "Time" and "Type of Therapy", suggesting that both therapy methods (DAT and TWD) yielded similar results. Analysis at the item level demonstrated significant effects of "Time" ($p < 0.05$) and its interaction with "Type of Therapy" ($p < 0.05$) on the frequency of vocalizations directed towards others. A strong association was seen between the "Time" variable and the "Type of Therapy" variable in relation to the scores of the "Gestures" item ($p < 0.05$). However, no significant correlation was discovered between the "Time" variable and the overall effect. Comprehension Scale, RDLS: Both groups demonstrated an improvement in comprehension skills due to the statistically significant main effects of the "Time" factor ($p < 0.001$). Nevertheless, the statistical analysis did not reveal a significant improvement between "Time" and "Type of Therapy," indicating that the benefits of both interventions are equivalent. Expression Scale, RDLS: Both groups demonstrated significant improvement in expression skills ($p < 0.001$). However, the statistical analysis did not reveal a significant improvement between "Time" and "Type of Therapy," Communication scale, VABS II: Results demonstrates that both treatment modalities (DAT and TWD) were equally effective in enhancing non-verbal and verbal communication skills. The "Time" factor was significant ($p < 0.01$), but the "Type of Therapy" interaction was insignificant, leading to a conclusion that both modalities are equally effective. Socialisation scale, VABS II: Both treatment modalities (TWD and DAT) were equally effective at improving social skills, with no significant difference between the two. The "Time" factor was significantly improve ($p < 0.01$) than the "Type of Therapy".
Liao et al. (2014) ²⁰	To learn more about the DIR/Floortime model, each mother took a 3-week one-on-one training course at the research lab. The mothers received training on how to pay attention to the cues given by their child, follow their lead as well as use age-appropriate play techniques.	10	10 hour per weeks	OTs as facilitator	Significant improvements were observed in the overall score of FEAS ($p < 0.05$) and in the engagement and relating area ($p < 0.05$), as well as in two-way purposeful emotional interaction ($p < 0.01$) and social problem solving ($p < 0.05$). There is a significant improvement observed in the VABS II assessment in the areas of communication ($p < 0.05$), daily living skills ($p < 0.05$), and social abilities ($p < 0.05$). The parent-child dysfunctional interaction score experienced a significant decrease ($p < 0.05$).

Table IV: Items related to risk of bias of included studies

Author, year	Main limitations	Funding sources	Declaration of interest
Ajzenman et al. (2013) ¹³	Small sample size, parental biases due to parent-report measure assessment tools, and unknown degree of consistency among therapists in their application of the HPOT therapy progression plan	Not stated	Not stated
Schaaf et al. (2014) ¹⁴	Small sample size, a limitation of validated instruments to assess change during the duration of 10-week intervention.	Autism Speak Foundation Treatment Grant	Not stated
Swain et al. (2020) ¹⁵	Monitoring the fidelity of clinician treatment provision in a classroom setting is not always feasible. Only 50% of providers responded when questioned for their feedback on the model's feasibility and acceptability by the researchers. Although the researcher assessed the treatment's endpoint results, they did not continuously monitor treatment response or skill maintenance at the follow-up.	The Louis and Rachel Rudin Foundation	Not stated
Reis et al. (2018) ¹⁶	The impact of maturation as well as other supports and services could not be evaluated because there was no control group. Unable to control how normal development and other confounding factors may affect results.	Funded by CIEd – Research Centre on Education, projects UID/CED/1661/2013 and UID/CED/1661/2016, Institute of Education, University of Minho, through national funds of FCT/MCTES-PT.	Not stated
Park et al. (2020) ¹⁷	Lack of sample size.	Not stated	No stated
Kahjoogh et al. (2020) ¹⁸	There exists no follow-up in the research to address the intervention effects' stability as well as small sample size.	No conflict of interest	Not stated
Hernández-Espeso et al. (2021) ¹⁹	After a brief intervention, it is difficult to identify subtle changes in specific aspects of communication and social skills due to the use of developmental milestones in diagnostic instruments. Not examined whether the intervention's benefits continued after the intervention ended.	No conflict of interest	No stated
Liao et al. (2014) ²⁰	Small sample size	Not stated	No conflict of interest

aspect of social communication skills. The majority of the studies analysed in this review found that OT interventions for social communication mostly concentrate on social skills training, including imitation skills, play skills, and joint attention. The study also examined animal-assisted intervention, contextual change, sensory integration, and behavioural control. These findings demonstrate the adaptability and originality of OT interventions in enhancing social communication abilities.

Although the majority of studies indicate positive outcomes, this analysis also identified variations in effectiveness.^{14,16-20} This review also discovered variety in effectiveness with on study showing no significant improvement¹³ and another reporting mixed result.¹⁵ This suggests that the success of interventions for ASD may be as unpredictable as the disorder itself.

Small sample sizes were highlighted as a primary limitation of the reviewed studies, limiting the generalizability of the findings and emphasising the need for larger-scale research. Furthermore, numerous studies have challenges with continued follow-up and consistent application of therapy, emphasising the importance of consistent protocol and long-term follow-up to determine the sustainability of intervention results

The absence of a control group in numerous studies hinders the direct observation of the improvements resulting from the intervention, underscoring the imperative for more stringent study designs in future research. Furthermore, the lack of assessment on the long-term effects of intervention, as well as their feasibility and acceptance, highlights specific areas where OT research should extend and enhance.

LIMITATIONS

This study has certain restrictions since the small number of research that were eligible for inclusion depending on the criteria that were incorporated.

CONCLUSION

In conclusion, while OT interventions shows promise in prompting social communication skills in children with ASD, this scoping review emphasises the need for additional research in several areas. Future research should aim to undertake more extensive studies with bigger and diverse samples, as well as incorporate longitudinal follow-up to assess the enduring effects of OT interventions. The effectiveness and practicality of evidence-based occupational therapy interventions for children with ASD can only be enhanced through rigorous research.

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