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Approaches Used in Occupational Therapy for People with Autism Spectrum Disorder: A Scoping Review

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Review Article

Abstract

Introduction: Autism spectrum disorder (ASD) consists of a group of multifactorial issues, and the onset of these disorders in social relationships is associated with behavioral issues that interfere with daily activities. Considering the breadth and depth of performance limitations, these people need a range of interventional and educational programs. Therefore, this study was designed to collect the approaches applied by occupational therapists for these people.

Materials and Methods: Research studies indexed in 3 scientific databases including OTseeker, Google Scholar, and PubMed were collected. Inclusion criteria included articles published in English, with the main subject of interventional occupational therapy in people with ASD, and published between 2000 and 2020. After selecting the keywords and organized search, the articles found were matched with the inclusion criteria, and finally 30 studies were selected.

Results: Based on our review of resources, occupational therapy interventions for people with ASD can be identified in several main categories as sensory-based interventions, relationship-based interventions, developmental skill-based programs, social-cognitive skills training, parent-directed approaches, intensive behavioral interventions, Early Start Denver Model (ESDM), pivotal response training (PRT), animal-assisted therapy, the cognitive orientation to daily occupational performance approach, floortime model, and the developmental model. Given that the focus of each approach is specific areas of skill and performance, it seems that administering combination of several approaches will be necessary and effective.

Conclusion: Based on performed researches, for application of any specific type of approach for a person with ASD, occupational therapists often focus on facilitating sensory processing and participation in play in young children, while in adolescents, occupational therapy goals can focus on social and behavioral performance and independence in society.

Keywords: Autism; Autistic disorder; Occupational therapy; Intervention

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Introduction

Autism Spectrum Disorder (ASD) covers a group of issues that affect multiple aspects of a child's life in the form of disorders. The onset of these disorders is in the early years of childhood as well as in interactions and social relationships; So that the inability to understand and interpret the emotional and social symptoms of the environment, lack or weakness in paying attention to what others pay attention to, and the inability to directly understand the thoughts and feelings of others is observed in them (1).

Among the set of behaviors that are common in people with ASD are self-harm, aggression, defiance, and stereotypical behavior. These challenging behaviors are physically dangerous and can hinder learning and normal activities. Additionally, these behaviors impose significant costs on the individual and the community due to the need to use rehabilitation services, human resources, and time spent, and this issue increases the difficulty of treatment, the main symptoms of ASD (2). Self-stimulating and self-harming behaviors in developmental disorders are a source of anxiety and suffering for people who have this behavior or for their families, and sometimes these behaviors are very severe

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and repetitive and threaten self-integrity (3).

Compared to children with normal development, children with ASD appear to be significantly weaker in the diversity of participation in activities in the areas of play, physical recreation, and social activities (4). Participation in meaningful activities that are essential for growth is often reduced in children with ASD (5). Due to the extent and depth of functional limitations, children and adolescents with ASD need to receive a wide range of interventions and educational programs; Because they have a range of work and performance issues that interfere with full participation in school, home, and social activities. Dominant features of autism that are often the focus of therapeutic interventions include limited social interaction, language delay or communication deficits, behavioral problems, and sensory processing problems (6).

ASD, which was considered a rare disorder (7), is now one of the most common developmental disorders in children, occurring more frequently than Down syndrome, diabetes mellitus (DM), and childhood cancers (8); ASD is said to be a common, lifelong disorder that affects one in 100 people (9). As ASD becomes more prevalent and accounts for a growing percentage of occupational therapy (OT) clients, more extensive research is being conducted on OT interventions in these patients (10). For this reason, in order to provide the most effective services and programs for these individuals, it is essential that occupational therapists be aware of interventions based on the best evidence of effectiveness; While based on extensive research, there does not appear to be a systematic review in this regard.

The purpose of scoping reviews is to identify and summarize key concepts in a specific field of research (11). In this type of study, unlike systematic research, the quality of resources is not examined and evaluated; In contrast, broader topics and research questions are presented to identify research gaps and recommendations are made for future studies. The aim of the present study was to evaluate the scope of OT interventions in patients with ASD. The main goal was to be aware of the approaches used by occupational therapists for people with ASD, as well as to identify interventions and programs that need further investigation. Using the results of the present study, the research and treatment path is reported and suggestions for future research are provided.

Materials and Methods

In this study, the scoping method presented by Arksey and O'Malley in five steps (11) was used, which includes "identifying research question, identifying relevant studies through electronic databases, designing inclusion and exclusion criteria for selecting relevant research, plotting data by performing a narrative review (e.g., classifying the strategies used in the interventions), and summarizing and reporting the results (e.g., by comparing the interventions).

Identifying the research question: The questions of the present study were: "How many studies of OT interventions were related to children with ASD? What research methods and clinical interventions were used in these studies?" And what kind of intervention strategies were reported in these studies?

Identifying related studies: In the present study, the OTseeker and PubMed databases and Google Scholar search engine were applied to collect data with advanced search strategies. It should be noted that in the OTseeker database, all articles published in the field of OT are indexed, and since the present study focused on OT studies, a separate search was not performed in the databases of the Institute for Scientific Information (ISI) and Scopus. Moreover, due to the fact that all articles published in Persian also have English titles and abstracts and are retrieved in the Google Scholar search engine, a separate search was not performed in Persian language databases. An example of a search strategy is provided in table 1.

Selection of studies: the inclusion criteria included publication of articles in English; the main topic: OT studies in people with ASD and publication of articles in the period 2000 to 2020. Since the aim of the present study was to achieve therapeutic interventions used in clinical practice worldwide, it seems that an intervention that has not been analyzed in the literature for the last 20 years cannot be an up-to-date and documented approach.

Table 1. An example of the research strategy in the PubMed database

Row	Search line	Filter	Results
1	autism[Title] OR autism spectrum disorder[Title] OR autistic disorder[Title]	2000-2020	27333
2	(autism[Title] OR autism spectrum disorder[Title] OR autistic disorder[Title]) AND (therapy[Title/Abstract] OR approach[Title/Abstract])	2000-2020	2844
3	(autism[Title] OR autism spectrum disorder[Title] OR autistic disorder[Title]) AND (occupational therapy[Title/Abstract] OR approach[Title/Abstract])	2000-2020	1872
4	(autism[Title] OR autism spectrum disorder[Title] OR autistic disorder[Title]) AND (occupational therapy[Title/Abstract])	2000-2020	120

Therefore, the search period of the last 20 years was considered. The study exclusion criteria were review studies and studies other than clinical trials.

Article Selection Steps: After entering the keywords and searching, first duplicate studies and then studies whose titles did not meet the inclusion criteria were removed. In the remaining studies, the abstract was reviewed and a number of studies were omitted due to non-compliance with the inclusion criteria. After that, the remaining studies were reviewed in full text in detail, and at the end, the ones that did not provide an intervention or a proper description of the implementation of the interventions were removed. All steps were performed separately by two independent researchers. The results of each stage were discussed by two researchers and in cases of disagreement, decisions were made by agreement of the two.

Data plotting: At this stage, the study process diagram was adjusted along with the drop in studies at each stage and the reason for omission or loss.

Summarizing and reporting of the results: After reviewing the full text of the articles, they were described based on the type of intervention, classification, and findings separately in the findings section.

Results

Out of 124 articles retrieved, 30 reached the analysis stage (Figure 1).

In general, conventional non-pharmacological treatments for ASD included behavioral interventions, developmental communication interventions, speech and language therapy, OT, psychotherapy, and parent/caregiver training (12). Occupational therapists, in most settings, were part of an interprofessional team that evaluated, designed, and implemented the child program. OT clinicians provided services to children and adults with ASD in the leadership and supportive roles (6). In the scientific literature, OT interventions for people with ASD could be classified into 11 categories, of which sensory integration and sensory-based interventions were the most widely used interventions in autism (Table 2).

These categories include sensory integration and sensory-based interventions, developmental skill-based programs, social-cognitive skill training, pivotal response training (PRT), intensive behavioral intervention, parent-directed or parent-mediated approaches, Early Start Denver Model (ESDM), Animal Assisted Therapy, and relationship-based interventions or interactive interventions (6,41).

Sensory Integration and Sensory-based Interventions: Abnormalities in response to sensory stimulation are very common in people with ASD and, in addition to the distress it can cause to the patient and caregiver, appear to be associated with other symptoms and problem behaviors in ASD, including limited and repetitive behaviors, self-harming behavior, anxiety, inattention, and gastrointestinal complaints (42). Despite the differences in the effectiveness of sensory integration, this approach is one of the most widely used interventions in autism. According to the Council for Exceptional Children (CEC) approach, Ayres sensory integration can be considered an evidence-based treatment for children with autism aged 4 to 12 years (43).

Sensory processing-focused interventions can be classified as sensory integration, sensory-based interventions (egg, massage, brushing), and auditory integration training (6). Sensory integration interventions appear to enhance the child's ability to modulate behavior and participate in social interaction (44).

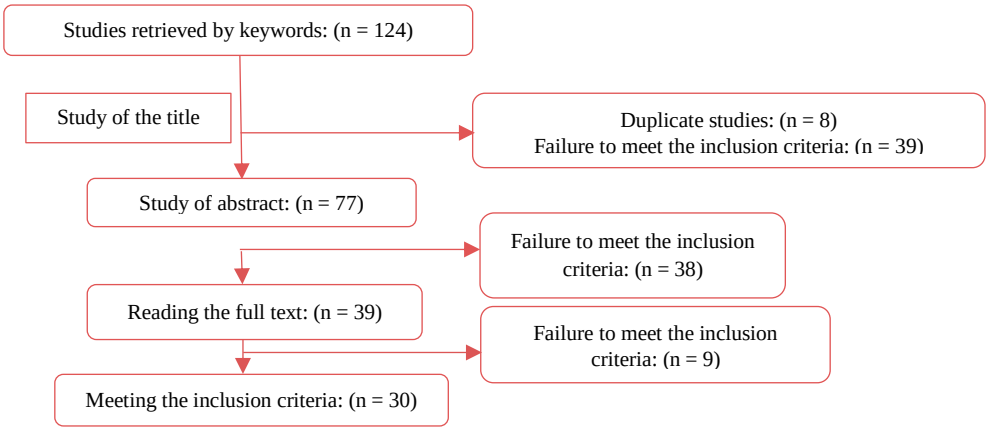

Figure 1. Study selection process

Table 2. Summary of the results of reviewed articles on occupational therapy (OT) interventions in people with Autism Spectrum Disorder (ASD)

Reference	Objective	Type of study	Results
		PRT	
Lydon et al. (13)	Comparison of the effectiveness of PRT and video modeling in acquiring and generalizing the oral expression of the play's represented in the actions	Experimental	The results showed that children with ASD who have sufficient language skills can improve their symbolic play skills through PRT. In addition, PRT led to a significant increase in the number of game actions shown by participants in the study.
		Social-cognitive skills training	
Dunn et al. (14)	The test was a contextual intervention among occupational therapists to improve participation in children with ASD and parental competence.	Pre-test-post-test repeated measurements	The results showed that parents felt more competent and their participation in children's daily lives increased significantly, and this approach was an effective OT intervention.
		Skill-based development programs	
Bremer et al. (15)	Investigating the effect of basic motor skills intervention on motor skills and adaptive behavior	Non-randomized clinical trial	Basic motor skills intervention may be useful for young children with ASD.
Ketcheson et al. (16)	Investigating the effect of timely motor skills intervention on motor skills, level of physical activity, and socialization of children with ASD	Non-randomized clinical trial	Findings were indicative of the importance of using a timely motor program as part of primary intervention services to young children with ASD
		Animal-assisted therapy	
Sams et al. (17)	To study and compare the use of language and social interaction in children with autism who received two forms of OT: 1. OT using standard techniques and 2. OT combined with animals.	Pilot	The results suggested that children showed significantly more language use and significantly more social interaction in sessions with animals compared to sessions of exclusive use of OT techniques.
Wuang et al. (18)	Evaluation of the effectiveness of 20 weeks of equestrian developmental simulation program on motor skills and sensory integrating functions in 60 children with autism	Clinical trial with cross-sectional design	Children with autism showed improvement in motor skills and sensory integrating functions. In addition, the therapeutic effect lasted for at least 24 weeks.
Llambias et al. (5)	Investigating the effect of attaching horses in OT interventions on participation in tasks	A project with several baseline	Children showed an improvement in task participation.
Nuntanee and Daranee (19)	Creating a treatment plan with the help of an electric elephant	Quasi-experimental with a pre-test-post-test design	The results showed that the elephant-assisted treatment program could be a different treatment to facilitate better balance control in people with ASD.
Hill et al. (20)	Evaluation of the effect of dog-assisted OT on task-keeping and goal-achieving behaviors in children with ASD and its comparison with conventional OT sessions	Clinical trial with a pilot	The results showed that despite the presence of a positive tendency for task-keeping and goal-achieving behaviors in the treatment group, the results were not statistically significant.
Hill et al. (21)	Gaining insights from parents who observed and participated in dog-assisted OT sessions for children with ASD.	Qualitative interpretive description	The parents described that including the dog in treatment seemed to provide emotional security in the adaptation facilitating sessions between their children and the therapists. However, they noted that including dogs for treatment alone was not enough to facilitate treatment participation for their children.

Table 2. Summary of the results of reviewed articles on occupational therapy (OT) interventions in people with Autism Spectrum Disorder (ASD) (continue)

Reference	Objective	Type of study	Results
Silva et al. (22)	Evaluation of whether dog contact can be a useful approach to invoking spontaneous imitation in people with ASD.	Repeated measurement tests	The results showed that children had more motivation and participation in spontaneous imitation in the living dog condition than in other situations, but the results were preliminary and did not show usefulness of including live dogs in interventions that promote social motivation and increase imitation skills in people with ASD.
Kalmbach et al. (23)	Exploring parents' perspectives on occupational therapy in a horse environment for children with ASD	Descriptive qualitative	The qualitative phase of the study showed that this intervention improved work performance, motivation, and social communication and self-regulatory in some children with ASD. Although the parents expressed concerns about the intervention, they generally found the intervention appropriate and acceptable.
Peters et al. (24)	Piloting a protocol for screening, evaluating, and intervening OT with horses and evaluating its effects on work performance, behavior, and social functioning goals in young people with ASD.	Several single case experimental baselines	According to each parent, the work performance, social motivation, and communication goals improved in the participants. 4 participants also showed reduced irritability and hyper-activity.
London et al. (25)	Examining parental perspectives on the effect of 5 sessions of animal assistance, including trained dogs with children with ASD	A phenomenological qualitative approach	17 parents reported that dog presence facilitated participation, enjoyment, and motivation in their children, in addition, it enhanced the child communication with others and dogs, behavioral regulation, and social participation.
	Cognitive bias approach to daily work performance		
Rodger and Brandenburg (26)	Investigating the effect of CO-OP on movement-based work performance goals	Study approach	The COOP-based intervention was effective in improving movement-based work performance in children with ASD.
	Parent guided or indirect approaches		
Gibbs et al. (27)	Discovering the use of telephone rehabilitation for participatory OT sessions with parents of children with ASD.	Pilot	The results demonstrated the potential of using telephone rehabilitation as a tool to improve participatory OT to improve home programs for children with ASD by providing opportunities for parents to ask questions, review sensory techniques, and understand the therapist's clinical reasoning.
An et al. (28)	Evaluating the effectiveness of OT training for parents of children with ASD and parents' measured perceptions and experiences of a family-centered approach for therapy	Preliminary to pre-test-post-test	Training parents improved work performance in both children and parents. The results showed that educating parents in an OT program can optimize the effectiveness of any treatment and introduces a family-centered approach to treatment; while maintaining sensory integrity.
Hoyo et al (29)	Explaining how OT in an outpatient setting guides the parents of a premature child with ASD from syringe feeding to accept spoon feeding.	Case report	The child's mother stated that prior to receiving OT services, other health care services were not helpful in their child's eating disorder.
	Intensive behavioral interventions		
Yingling and Bell (30)	Evaluation of the effectiveness of intensive behavioral intervention on 3-year-old children with ASD	Randomized clinical trial	The need to monitor the use of intensive behavioral intervention and confirm research on the possibility of its presentation was identified.

Table 2. Summary of the results of reviewed articles on occupational therapy (OT) interventions in people with Autism Spectrum Disorder (ASD) (continue)

Reference	Objective	Type of study	Results
		Communication-based interventions, interactive interventions	
Girolametto et al. (31)	Describing the consequences for three parents and their children following participation in a social interaction language intervention model	Multiple case study	The results indicated that all three mothers increased their responsive opinions during play interactions and all three children showed obvious positive consequences in vocabulary and number of participations in social interaction. Moreover, there was an improvement in social initiation skills for the three children.
		ESDM	
Cidav et al. (32)	Determining the effectiveness of ESDM in treating children with ASD	A randomized trial	The children who received ESDM during the intervention had average annual overall health-related values that were higher than those of children who received community-based treatment.
		Floortime model and growth model, individual differences, based on relationship	
Salman (33)	Promoting secure attachment behaviors with a Floortime/relationship-based program in children with ASD	A clinical trial	The findings suggested that the Floortime/relationship-based program was statistically significant in promoting safe attachment behaviors and was effective in relieving autism in the study sample from severe to moderate level.
		Sensory integration and sense-based interventions	
Watling and Dietz (34)	Evaluation of the effects of Ayres's sensory integration intervention on behavior and task involvement in young children with ASD	A single case study with an A-B-A-B design	When the effects were measured immediately after the intervention, the Ayres's short-term sensory integration was not significantly different from a play scenario on unwanted behavior or involvement in children with ASD. However, non-objective data suggested that Ayres's sensory integration intervention can have an effect that is evident during treatment sessions and at home.
Iwanaga et al. (35)	Evaluation of the effectiveness of sensory integration treatment for children with ASD with high performance	Pilot	The findings revealed that except for the verbal index, the total score and the score of other indicators in the sensory integration treatment group increased significantly; While only the total score in the treatment group increased. Furthermore, the sensory integration treatment group showed higher scores on coordination and nonverbal scores.
Schaaf et al. (36)	Evaluation of a manual intervention for sensory problems in children with autism aged 4 to 8 years.	Clinical trial	The results showed that the children in the treatment group who used 30 sessions of OT intervention received significantly higher scores in the field of goal achievement scale and better significant scores in helping the caregiver in self-care and socialization compared to the control group with normal care.
Alaniz et al. (37)	Evaluation of the feasibility and effectiveness of water-dependent treatment program in water safety skills and social skills in children with mild to severe ASD	Pilot	The findings showed a significant improvement in swimming skills scores. Although social skills did not respond to intervention.
Mills and Chapparo (38)	Understanding teachers' perceptions of using a sensory activity schedule, a sense-based intervention in the classroom	Pilot	In this study, teachers reported increased concentration and decreased unwanted behaviors in students.

Table 2. Summary of the results of reviewed articles on occupational therapy (OT) interventions in people with Autism Spectrum Disorder (ASD) (continue)

Reference	Objective	Type of study	Results
Randell et al. (9)	Sensory integration intervention instead of routine care for children 4 to 11 years old with ASD and sensory processing problems	Randomized clinical trial with a pilot	Provided high-quality evidence of the clinical effectiveness of a sensory integration intervention that aimed to improve behavioral, functional, social, educational, and welfare outcomes for children and welfare outcomes for caregivers and families.
Pashazadeh Azari et al. (39)	Investigation of the effects of adapted manual contextual intervention for ASD and essential elements of intervention in promoting child participation and mother's parenting self-efficacy	Randomized clinical trial	The adapted manual contextual intervention can provide significant effects in eliminating sensory problems, promoting child participation, and parental efficiency in the ASD family compared to normal treatment. The parents reported high levels of acceptance, in addition to confirming family achievement.
Foster et al. (40)	Understanding the perception of mothers of children with ASD in 10 one-hour sessions	Qualitative study	The findings showed that parents perceive the therapist-parent relationship along with analysis and reflection as core characteristics that facilitate increased mindfulness and self-efficacy. The findings also suggested that through critical analysis and critical reflection, mothers developed a better understanding of their child and became more mindful of their context and resources, which increased their sense of self-efficacy.

PRT: Pivotal response training; ASD: Autism Spectrum Disorder; CO-OP: The Cognitive Orientation to Daily Occupational Performance Approach; ESDM: Early Start Denver Model; OT: Occupational therapy

Sensory-based interventions, such as those that provide therapeutic touch, can reduce maladaptive and hyperactive behaviors, as well as hinder self-stimulation and stereotypic movements and improve attention and concentration (45). Sensory integration therapy is a face-to-face therapy in which occupational therapists use play-based sensory-motor activities and exactly the right challenges (activities that are neither too hard to cause failure and disappointment in the individual not too easy to cause loss of excitement in the individual) to influence the way the child responds to the senses, to reduce anxiety, and to improve motor skills, adaptive responses, concentration, and interaction with others (9). Furthermore, sensory integration intervention in combination with behavioral interventions may help reduce stereotypic behaviors in children with autism (46).

It should be noted that cooperation between the child and the therapist can be an important aspect in the treatment of sensory integration for young children with ASD (47). The sensory integration model that complements drug therapy and cognitive-behavioral therapy is even more important; Because it considers the related sensory needs and provides the ability of functional self-regulation (3).

Relationship-Based Interactive Interventions: Occupational therapy clinicians often combine sensory integration interventions with individually designed interactive play activities to promote play and social participation (6). These interactive, relationship-based interventions focus on improving the socio-emotional development of children with ASD and are consistent with the philosophy of OT (48). Relationship-based interventions use adult imitation of child's actions, implement high levels of positive response, use promotion and guidance, facilitate peer interaction, create environments that support social interaction, and indicate positive effects on social participation in children with ASD (48). In reciprocal imitation training, occupational therapists can use imitation to increase participation and interaction with a child with ASD. This approach is especially useful when the child avoids or does not engage in therapy (41). The communication development intervention used by occupational therapists for ASD focuses on copying with change, being more flexible, and integrating information from multiple sources (41).

Skill-Based Developmental Programs: Comprehensive programs for young children with autism often use developmental-based structural models that include OT services. These programs are play-based, peer-assisted, and focus on the child's strengths, and include professionals from a variety of disciplines. Because children with ASD are often strong in visual processing, interventions that use visual clues and visual learning are effective in promoting communication and learning (6). In treating and educating children with autism and communication-related disabilities, occupational therapists can combine many vision support strategies. Although the effectiveness of this approach is currently unclear, according to a review study, it can be useful for improving motor skills and cognition (41).

Socio-cognitive skills training: The hallmark of autism is the difficulty in social skills or lack of social skills (6). Cognitive-based social skills training, in which simple and separate steps of social-emotional skills are explained, modeled, and practiced, seems to have moderate positive effects (49). Social communication, emotional regulation, and transfer support are a comprehensive model used as a team, and occupational therapists are part of the team that incorporate emotional regulation (41).

Parent Guided or Indirect Approaches: Training parents is typically part of an OT intervention. Most training programs for parents are implemented in order to achieve the two goals of improving child performance and managing child behavior and reducing maladaptive behaviors (6). Educating parents about autism and behavior management can improve a parent's self-confidence and self-esteem, as well as the child's behavior (50). The Son-Rise program focuses on using the child's inherent motivations to participate and interact and helping parents to be optimistic and help their child learn and succeed. This approach is very playful and open to include sensory therapy; However, there is currently no published evidence of efficacy for this program (41).

Intensive Behavioral Interventions: Behavioral interventions are widely used for children with ASD and have the strongest research evidence base. Occupational therapists do not typically design or direct intensive behavioral intervention, but may consult with the behavioral therapist, recommend strategies for the child's physiological and sensory needs during the program, or provide support and information to families participating in the behavioral program. (6). OT texts do not reflect any use of Applied Behavior Analysis (ABA) despite the strong evidence base. Occupational therapists may today avoid using the principles of ABA, realizing that ABA is not client-centered (51). Positive behavioral support has moderate to strong effects on reducing problematic behaviors in children with ASD (52). A systematic approach including preventing problematic

behaviors through the use of ongoing behavioral education, improving the environment to promote appropriate behaviors, and collecting data to monitor the child's progress seems to have many effects (6). There is growing evidence that intensive and early behavioral intervention, while costly, can have lifelong benefits in functioning (53).

ESDM: This model is a comprehensive, naturalistic, developmental, and behavioral intervention for children with ASD aged 12 to 60 months in which strategies based on applied behavior analysis are trained (32). Occupational therapists can use strategies of this model that focus on shared attention and shared interaction and use a behavioral approach in the natural environment (41).

PRT: PRT is a technique that allows a child with ASD to choose an activity and considers systematic reinforcements for all the correct answers and all the efforts made by the child to respond, thus increasing motivation and generalization in children with ASD (13). PRT specifically teaches response to multiple clues, and occupational therapists can combine it with tasks such as visual-perceptual-motor tasks (41).

Animal-assisted Therapy: Animals can be soothing for people with ASD and help improve language skills and social interaction (45). If occupational therapists are trained for this approach, this approach can be used in OT sessions (54). Animal-assisted therapy is an intervention for children with ASD (29). Dog-assisted therapy is thought to facilitate the participation of children with ASD in treatment sessions (21).

Cognitive Orientation to Daily Occupational Performance Approach (CO-OP): CO-OP is a child-centered and cognitive intervention that focuses on empowering children to achieve functional goals (55). This approach has been shown to be effective for children with high-functioning ASD (56). Cognitive and cognitive-behavioral approaches emphasize visual learning and consider individuals' intrinsic motivations for learning that are important for achieving behavioral outcomes (41).

Floortime Model and Developmental Model based on Individual Differences and Relationship: Floorime is a family-oriented intervention approach with strategies that can be easily incorporated into OT sessions in a natural or play-based environment (57). The relationship-based developmental model of individual differences is a comprehensive program that considers the level of emotional development of the child, unique abilities and needs, and their preferences (41).

Discussion

As autism is a common problem in society, the need for services and programs that effectively promote the performance and participation of people with ASD as students, family members, and staff increases (6). Therefore, the present study was conducted with the aim of collecting and summarizing the approaches used by occupational therapists in these individuals. The results demonstrated that OT interventions in these people fall into 11 categories; it seems that using several approaches in combination will be more effective.

The best known treatment for sensory symptoms in ASD involves an OT program that is tailored to the individual's needs and can include sensory integration therapy, a sensory diet, and environmental modifications (42). Based on the studies of Case-Smith and Arbesman (6), Randell et al. (9), and Schaaf et al. (36), sensory integration intervention has positive behavioral and social consequences in children with autism. Additionally, the results of investigations by Smith and Arbesman (6) and Randell et al. (9) suggested that treatment improves sensory integration, motor skills, adaptive responses, concentration, and interaction in children with autism, in addition to reducing anxiety. While some empirical evidence supports the sensory integration therapy, a sensory diet, and environmental modifications, further research is needed to evaluate their efficacy and other tools reducing these symptoms (42). If these therapies are accompanied by pharmacological and cognitive-behavioral therapies and are also designed and implemented in the form of interactive play activities, it will have more positive effects on these children. In general, it can be said that understanding unique and problematic behaviors and the significant role of sensory processing dysfunction and parental stress in problematic behaviors in children with ASD can help occupational therapists in designing appropriate interventions.

In examining the effectiveness of animal-assisted therapy, the researchers found that including horse-riding in the treatment program for children with autism improved communication and interaction, and social motivation and task participation in the child (5,23,24). On the other hand, the results of studies showed that in OT sessions performed with the help of dogs, children with autism experienced more emotional security, staying on task, and adapting to the therapist, but the results were preliminary or statistically insignificant, requiring more research (20-22). Furthermore, animal-assisted therapy for children requires consideration of the necessary precautions to follow the principles of hygiene and safety of the child with the animal.

Since parental education is typically part of OT intervention, research has shown that parental

education improves work performance in both children and parents, in addition, it improves parents' sense of self-efficacy and mindfulness, optimizes the effectiveness of treatment, and significantly enhances parents' feeling of competence and participation in the daily life of children (14,28,40). In fact, training parents/caregivers will complement the provision of family-centered interventions in OT.

Limitations

It should be noted that the present study was limited to three databases. Examining more databases provides more articles to browse. Involving more reviewers can increase the number of articles selected.

Recommendations

In this scoping review, two major research gaps emerged in the literature, namely that future research should explore how to develop basic skills for mobility in the community, communication and social skills, and autistic needs in a comprehensive design. There is also little information on how the specific educational services received by students with ASD vary depending on age, severity of disability, and demographic characteristics. Therefore, based on the findings of research, it is suggested that future studies examine interventions to develop basic skills for mobility in society and communication, as well as special educational services for students with ASD.

Conclusion

In selecting and applying specific approach (s) for people with ASD, in young children with ASD, occupational therapists often focus on facilitating children's sensory processing, sensory-motor function, social-behavioral function, self-care, and play participation. And it can be said that understanding the problematic and unique behaviors and the significant role of sensory processing dysfunction and parental stress in problematic behaviors in children with ASD, can help occupational therapists in designing appropriate interventions. In older children and adolescents, however, OT goals can focus on social and behavioral functioning, transition to employment, and independence in society. In general, the three unique roles of OT for children with ASD include developing the prerequisites for verbal and nonverbal communication, adapting the environment, child teaching-participation-support, and providing work-based intervention. These three issues are intertwined with the specific areas of OT that are expressed in the context of the individual-environment-work. Besides, it seems that using several approaches in combination will be more effective.

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Authors' Contribution

Simin Asadi: study support, executive, and scientific services, providing study equipment and samples, data collection, analysis and interpretation of results, manuscript preparation, specialized evaluation of manuscript in terms of scientific concepts, approval of the final manuscript to be sent to the journal office, responsibility for maintaining integrity of the study process from the beginning to publishing, and responding to the referees' comments; Hosein Sourtiji: study design and ideation, study support, executive, and scientific services, manuscript preparation, specialized evaluation of the manuscript in terms of scientific concepts, approval of the final manuscript to be sent to the journal office, responsibility for maintaining integrity of the study process from the beginning to publishing, and responding to the referees' comments.

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Conflict of Interest

The authors do not have a conflict of interest.

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