Research Article

Sensory Diet Program Through in-Person and Tele-Occupational Therapy in Children with Autism Spectrum Disorder: A Randomized Single-Blind Controlled Trial

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Running Title: Sensory diet through tele OT in children with ASD

Abstract

Introduction: Autism spectrum disorder defines a disorders in the fields of sensory processing, social communication and occupational performance. Sensory diets can have positive effects on these fields. Current research compared the effectiveness of the sensory diet program with and without tele occupational therapy on sensory processing pattern, social competency and occupational performance in autism spectrum disorder

Material & Methods: The study population was 32 children with autism spectrum disorder 4-10 years old. They were placed in two control and intervention groups. The number of sessions for both groups was twenty 30 minutes sessions over 8 weeks. In both groups, through photos,

videos and explanations, sensory problems were described, activities and environmental adaptations were presented, implemented by the mother, and the therapist supervised the implementation. In this study, three tools of sensory profile 2, Social Responsive Scale 2 and Canadian Occupational Performance Measure were used.
Results: According to the sensory profile 2, social responsiveness scale and Canadian Occupational Performance Measure, processing in the areas of auditory, visual, touch, movement, body position, oral, conduct, social emotional, attentional, sensory seeking, sensory avoiding, sensory sensitive, low registration, social awareness, social cognition, social communication, social motivation, limited interests, repetitive behaviors and occupational performance in both groups have a significant difference(P-value < 0.05).
Conclusion: It seems that providing a sensory diet program through tele occupational therapy on sensory processing pattern, social competency and occupational performance is applicable as well as face-to-face occupational therapy in children with ASD.
Keywords: Telerehabilitation, Sensory, Social Behavior, Participation, Autism

Introduction

Autism spectrum disorder (ASD) as a group of neurodevelopmental disorders leading to difficulties in social communication, limited interests, and repetitive behaviors. People with ASD have unusual cognitive functions [1]. Sensory processing deficits is one of the most pervasive features of ASD [2], which is evident in the effect of this disorder on the fundamental features of human social behaviors [3]. Children with ASD often display sensory processing difficulties and receive treatments for self-regulation [4]. Lefebvre et al. (2021) contend that disorders in sensory processing patterns, caused by an imbalance between stimulation and inhibition, are one of the key symptoms of children with ASD. Facing any of the ASD symptoms reduces these children's quality of life and makes them lose the meaning of life [5]. In recent years, plenty of efforts have been put into fulfilling the sensory needs of ASD children through sensory diets [6]. Sensory diets, as an effective intervention, offer sensory-based strategies to make these children experience an optimal level of arousal in a relaxed state of alertness throughout the day and enhance their occupational performance. Sensory diets comprise a wide variety of occupational therapy interventions that can be utilized in a person's daily life [7]. Although different individuals respond differently to sensory diets, these diets can play a constructive role in sensory processing, psychosocial skills, and problem-causing behaviors [8]. These diets calm, alert, and organize children with ASD, improving their occupational performance [9].

Since 1995, there has been a growing number of studies on telerehabilitation. These articles have examined different types of telerehabilitation and concluded that the use of these services is a promising solution to providing rehabilitation interventions and promoting patients' quality of life. Studies has also revealed that the integration of these technologies boosts patients' access to rehabilitation services, increases the efficiency of service delivery, and facilitates the accessibility to professional consultation [10]. Furthermore, families with ASD children have accepted telehealth assessments [11]. However, the number of studies conducted on tele-occupational therapy in Iran is relatively small, and as far as we know, no study in Iran has been designed to investigate the impact of sensory diet programs along with tele-occupational therapy. In a study undertaken by Pashazadeh Azari et al. (2019) in Iran, the sensory diets were conducted using the coaching approach. In this study, the role of contextual interventions (adapted for children with ASD) in promoting child participation and parental competence was examined. Contextual interventions included sensory processing models, parental guidance, and social support models. Findings of studies showed that compared to conventional treatments, this intervention has a great effect on reducing sensory problems and raising child participation and parental competence in the families. Moreover, high levels of family

acceptance were reported [12]. In a study by Gibbs and Toth-Cohen (2011), the results demonstrated that telerehabilitation was a promising way of providing collaborative occupational therapy services and improving family-centered programs for children with ASD [13]. Considering the aforementioned gaps, the present study aimed to compare the impact of a family-based sensory diet program with and without tele-occupational therapy on the sensory processing pattern, social competence, and occupational performance of children with ASD.

Materials and Methods

Study design

The study was a randomized (single-blind) clinical trial. Level 1 and 2 in ASD children determined based on Gilliam Autism Rating Scale, 3rd Edition (GARS-3). The ethical consent was obtained from the Ethics Committee of Shahid Beheshti University of Medical Sciences and the trial was registered in the Iranian Registry of Clinical Trials. The informed consent was signed by the mothers of the children. The study was performed from June 2022 to April 2023.

Study Participants

Children with level one and level two ASD were enrolled using convenience sampling from the autism rehabilitation centers in Tehran. Unfortunately, all the samples withdrew from the study because WhatsApp was filtered and the internet speed was unstable. As a result, sampling was carried out again after three months. Children with level 3 ASD were excluded due to their severe mental problems. Moreover, their family had to face many challenges using this type of intervention and had low self-confidence in encountering these challenges.

Inclusion Criteria

The inclusion criteria for children were as follows: (1) being diagnosed with ASD by a child psychiatrist and of level-one and level-two ASD by an occupational therapist using the GARS-3, (2) having an age range of 4 to 10 years, and (3) not being diagnosed with other neurological disorders, such as epilepsy and other psychiatric disorders.

The inclusion criteria for the main caregiver were as follows: (1) the mother’s functioning as the main caregiver, (2) having at least a diploma degree, (3) having access to the Internet and VPN, and (4) being able to work with the required software (WhatsApp)

To maintain the internal validity of the results and ensure that consulting and intervention services were the only reason for the improvements, a number of exclusion criteria were also considered as follows: (1) absence for a maximum of three sessions, (2) making changes in the program or being unwilling to continue their participation in the study, (3) partaking in other sensory programs.

Study procedure

Initially, thirty two 4- to 10-year-old children with ASD level I and II who were referred to the rehabilitation clinics in Tehran (the available samples) and met the inclusion criteria took part in this research. However, the study of all these subjects ceased .Another inclusion criterion was added: the availability of proper VPN. After two months, 32 other children meeting the inclusion criteria were chosen from the rehabilitation clinics in Tehran. The mothers of these children filled out the demographic questionnaire and signed the written consent. Then, the samples were matched in terms of gender and ASD levels. To allocate the children to the

experimental and control groups, a simple randomization method was used. In this method, the occupational therapist gave an envelope to the mothers and asked them to take out a card from it. The cards were randomly arranged, and cards A and B represented the intervention and control groups, respectively. In this way, 32 children were assigned to control and tele-intervention groups. In the second round of sampling, none of the 32 children withdrew from the study.

By considering the type I error of the test ($\alpha = 0.05$) and the type II error of the test ($\beta = 0.2$) (i.e., A power level of 80%) and estimating the mean (M) values of $1\mu = 3.4$ and $\mu 2 = 5.4$ and the standard deviations (SD) of $1\sigma = 1.1$ and $2\sigma = 2.5$ for the variable of occupational performance based on Jamali et al. (2022) [14], the proper number of samples in each group turned out to be 16 (total n= 32)

Study assessment

Sensory profile-2(SP-2)

SP-2 evaluates children's sensory processing characteristics and patterns including sensory avoiding, sensitivity, seeking, and low registration. The SP-2 scale also measures six sensory systems (including auditory, visual, touch, movement, body position, and oral sensory processing) and three behavioral parts (including conduct, attentional, and social-emotional). In this study, the children's form was utilized, which contained 86 items and was completed by the parents or caregivers on a 5-point Likert scale (from 1=never, to 5=always). Higher scores indicated more sensory processing impairment while lower scores showed less sensory processing impairment [15]. The Cronbach's alpha values of 0.61 to 0.91 and the test-retest reliability coefficients of 0.72 to 0.95 were reported for the Persian version [16].

Social Responsiveness Scale-II (SRS-2)

The SRS-2 measures ASD-related difficulties in social behaviors. This tool is completed by several evaluators who have a working relationship with the patient for at least one month, and "moderate literacy" is required for completing the forms [17]. The results of completed questionnaire were reported as t-scores (M=50, SD=10) for the treatment subscales and for the whole scale (as the total score). T-scores of ≥76 are considered as severe impairment. 66≤ T-scores≤75 are considered as moderate impairment, showing the presence of several noticeable social impairments. 60 ≤T-scores ≤ 65 are deemed to be mild impairment, T Scores≤ 59 shows that a person probably does not have any clinically significant ASD problems. Mirzakhani Araghi et al. (2021) has reported Cronbach's alpha of 0.93 for all the subscales and the validity and reliability of 0.82 and 0.86, for its Persian version respectively [18].

Canadian Occupational Performance Measure (COPM)

This questionnaire is completed through a semi-structured interview, and occupational performance problems are identified in three areas of productivity, personal care, and leisure. Throughout the interview, occupational performance problems are recognized and rated from one to ten based on their importance. Then, a score is given to each problem considering occupational performance and satisfaction of occupational performance. A change of two points or higher as a result of the intervention is clinically deemed to be significant. In the case of children, this questionnaire can be completed by their parents [19]. This tool was translated into Persian by Dehghan et al. (2014), and the psychometric properties of the Persian version were verified [20].

Gilliam Autism Rating Scale, 3rd Edition (GARS-3)

The GARS-3 scale developed in 2014 for the screening and diagnosis of ASD in people aged 3 to 22 years. It consists of six subscales: stereotyped behaviors (13 items), social interaction (14 items), social communication (9 items), emotional responses (8 items), cognitive style (7 items), and maladaptive speech (7 items) [21].The psychometric properties of the GARS-3 for individuals with ASD in Iran were confirmed in 2018 [22].

Study Intervention

In this research, the children who received the sensory diet only through this program were included. They continued attending their other programs, such as occupational therapy in the field of mental health and play therapy. These programs were also checked to ensure that none of them involved sensory interventions or sensory integration sessions. Both control and intervention groups took part in twelve 30-minute sessions over an 8-week period. In the first four weeks, two sessions were held per week whereas, in the second four weeks, one session was held per week. The study contained three phases: 1) protocol design, 2) intervention, and 3) follow-up. In the first phase (protocol design), the sensory diet intervention protocol was prepared for all four sensory processing patterns based on Dunn's model. The activities were then specified for all four sensory processing patterns and approved by the expert panel. The sensory diet protocol included activities and environmental adaptations. Afterward, for the initial evaluation, the SP-2, the SRS-2, and the COPM were administered as pre-intervention tests.

In the second phase (intervention), the children were stratified based on gender and ASD levels. The samples were then randomly divided into two groups: face-to-face occupational therapy (control group) and tele-occupational therapy (intervention group). Both groups were given explanations of sensory problems through photos and videos and provided with activities and environmental adaptations. After that, the mothers implemented the program under the supervision of the therapist.

The face-to-face (control) group partook in 12 sessions for eight weeks, eight half-hour sessions in weeks one to four (two sessions per week) and four half-hour sessions in weeks five to eight (one session per week) at the clinic. These sessions were held for the following purposes: raising parents' awareness of the child's sensory pattern, explaining the effect of the child's sensory pattern on his/her behaviors, familiarizing parents with the necessary activities and environmental adaptations and how to perform them, and providing parents with videos along with the therapist's explanation. As for the telerehabilitation (intervention) group, 12 30-minute sessions were held for eight weeks, eight half-hour sessions in weeks pe to four (two sessions per week) and four half-hour sessions in weeks five to eight (one session per week). The sessions were held in the form of video conferences using WhatsApp software. Depending on the child's disorders and the family's circumstances, some sessions were held in pairs (the therapist and the mother) and some in threes (the therapist, child, and mother). In these sessions, the following essential items were included: sending videos on how to implement the intervention to the mother via WhatsApp, watching the mother implement the intervention, and identifying and amending her mistakes online. The trained sensory diet was followed by the mother three times a week, each time for half an hour. On the whole, the mother attended two meetings with the therapist per week and implemented the program three times a week without the therapist's supervision. After the second phase, the scales were administered as post-

intervention tests. In the third phase (follow-up), the scales were administered one month after the intervention as follow-up-intervention tests. As this study was a randomized, single-blind clinical trial, the first and third evaluations were performed by another occupational therapist who was quite familiar with these scales. The interventions provided in each session for the groups are presented in Table 1.

Table 1. Interventions in face-to-face and telerehabilitation groups

Week	Session	Interventions in face-to-face group (12 face-to-face sessions at the clinic) and telerehabilitation group (12 sessions through video calls on WhatsApp)
1	١	Explain the purpose of the study and importance of sensory diet program to the mother
1	٢	Describing the areas in which the child has problems
2-4	٣-8	Providing activities and environmental adaptations, which were then implemented by the mother under the supervision of the therapist
5-8	9-12	Error correction by the therapist and question-asking by the mother

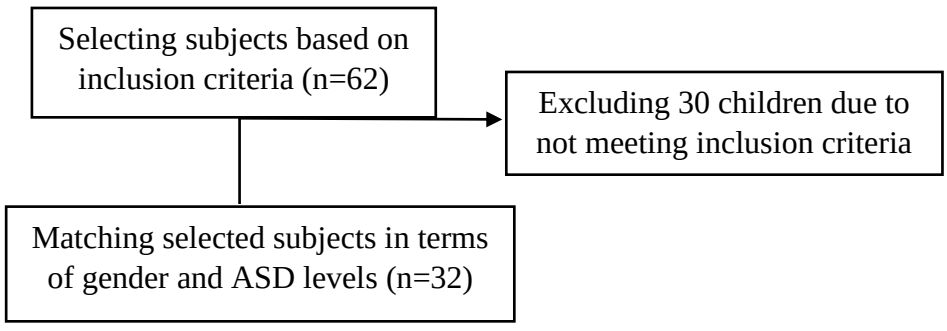
Statistical analysis

For checking the normality disterbution of the data the Kolmogorov-Smirnov one-sample test was used. Given the normally distributed data and the administration of the scales at three time points, repeated measures ANOVA was used with the Bonferroni post hoc test. Moreover, the independent- and paired-samples t-tests were run for inter- and intra-group comparisons, respectively. The significance level was set to 0.05 in this study. Therefore, the P-value≤ 0.05 were considered statistically significant. Data were analyzed by SPSS software version 18.

Results

In terms of gender, there were 11 boys and 5 girls in each group. Concerning the ASD levels, each group was comprised of 11 children with level one ASD and 5 children with level two ASD.

Figure 1 illustrates the procedure of the second-time sampling. None of the 32 subjects selected in this sampling withdrew from the study.



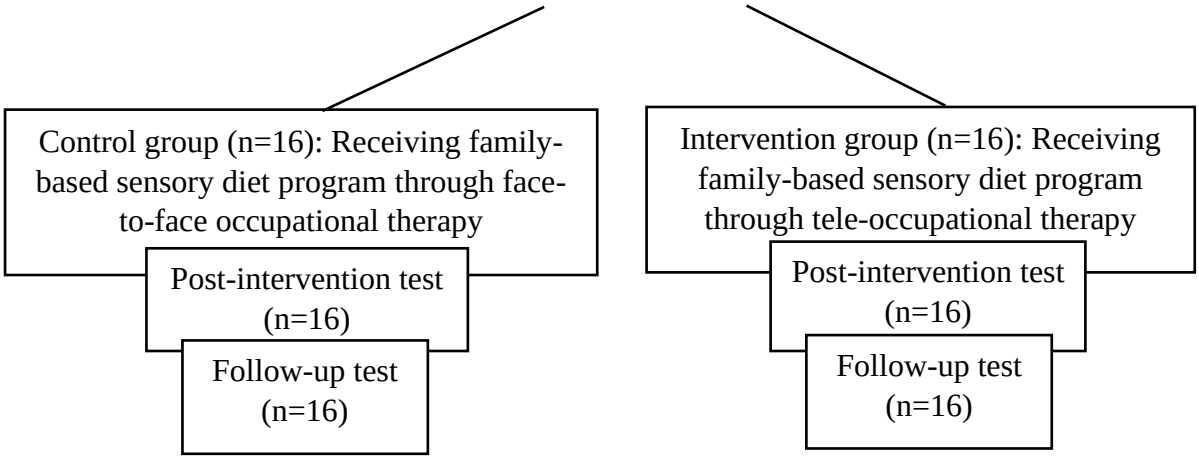


Figure 1. Sampling and Intervention procedure in groups

Table 2 provides the demographic characteristics of the children.

Table 2. Demographic characteristics of participants (N=32)

Variables		Control group (n = 16)	Intervention group (n = 16)
Age	**Mean (SD)**	5.13 (1.628)	4.94 (1.611)
Sex	**Male**	11	11
	Female	5	5
ASD level	**Level I**	11	11
	Level II	5	5
Parental education	**Associate or bachelor's degree**	15	13
	Master's degree	1	3

As shown in Table 2, the mean (M) and standard deviation (SD) of the age of the subjects in the intervention group were 4.94 and 1.61, respectively. The subjects in the control group had an age mean of 5.13 with a standard deviation of 1.63. As the results of the independent samples t-test showed (p =0.746), there was no significant difference in the age of the two groups.

Table 3 the results of repeated measures ANOVA test

Measure	Control group		Intervention group		Group difference	
	Mean	Standard Deviation (SD)	Mean	SD	Test statistic	P value
COPM						
Occupational Performance						
Pre-intervention	7.13	1.821	7.31	2.024	0.275*	0.785*
Post-intervention	8.19	1.759	8.38	1.784	0.014+	0.908+

Follow-up	8.62	1.893	8.69	2.024	0.199+	0.659+
Sensory Profile 2						
1. Auditory Processing						
Pre-intervention	25.88	6.174	24.00	7.394	-0.779*	0.442*
Post-intervention	22.63	3.117	21.56	4.487	0.027+	0.871+
Follow-up	22.38	3.117	21.19	4.324	0.181+	0.674+
2. Visual Processing						
Pre-intervention	19.06	5.348	18.69	4.143	-0.222*	0.826*
Post-intervention	16.81	3.710	16.44	2.502	0.235+	0.632+
Follow-up	16.62	3.538	16.25	2.380	0.304+	0.586+
3. touch Processing						
Pre-intervention	36.06	8.442	33.88	3.879	-0.942*	0.354*
Post-intervention	31.44	3.669	29.44	4.163	1.380+	0.250+
Follow-up	30.88	3.775	28.87	3.897	1.461+	0.237+
4. movement Processing						
Pre-intervention	27.25	4.297	24.88	6.260	-1.251*	0.221*
Post-intervention	23.25	3.276	22.63	3.686	1.936+	0.175+
Follow-up	22.81	2.880	22.44	3.723	2.339+	0.137+
5. body position Processing						
Pre-intervention	28.00	3.098	25.00	4.243	-2.284*	0.030*
Post-intervention	23.88	2.125	21.94	3.473	0.013+	0.912+
Follow-up	23.56	2.220	21.75	3.435	0.007+	0.933+
6. oral Processing						
Pre-intervention	33.88	2.849	32.50	4.050	-1.111*	0.275*
Post-intervention	28.88	2.680	28.25	3.838	0.671+	0.419+
Follow-up	28.81	2.903	27.63	3.557	0.039+	0.846+
7. conduct responses associated with sensory processing						
Pre-intervention	30.75	2.324	26.00	3.916	-4.173*	0.000*
Post-intervention	26.44	1.750	22.87	3.344	0.128+	0.723+
Follow-up	26.19	1.974	22.81	3.331	1.020+	0.321+
8. social-emotional responses associated with sensory processing						
Pre-intervention	48.94	3.820	45.81	5.010	-1.984*	0.056*
Post-intervention	41.69	2.414	39.25	3.606	0.990+	0.328+
Follow-up	41.37	2.849	38.75	3.587	1.128+	0.297+
9. attentional responses associated with sensory processing						
Pre-intervention	34.50	3.141	30.69	4.686	-2.703*	0.011*
Post-intervention	29.81	2.664	26.88	3.594	0.021+	0.885+
Follow-up	29.44	2.732	26.56	3.162	0.365+	0.550+
10. sensory seeking						
Pre-intervention	64.06	7.122	58.81	5.480	-2.337*	0.026*
Post-intervention	55.00	5.266	52.19	4.665	0.652+	0.426+
Follow-up	54.50	5.254	51.63	4.425	0.324+	0.574+
11. sensory avoiding						
Pre-intervention	68.56	4.746	62.25	8.012	-2.711*	0.011*
Post-intervention	59.19	3.250	54.38	5.932	0.788+	0.382+
Follow-up	58.50	3.033	53.69	5.851	1.044+	0.315+
12. sensory sensitivity						
Pre-intervention	64.88	5.772	60.13	6.571	-2.172*	0.038*
Post-intervention	56.19	3.600	52.63	6.021	0.137+	0.714+
Follow-up	55.31	4.159	51.50	5.416	0.542+	0.467+

13. sensory low registration						
Pre-intervention	73.06	5.131	68.13	7.728	-2.129*	0.042*
Post-intervention	63.00	4.066	58.75	5.791	1.043+	0.316+
Follow-up	62.38	4.440	58.00	5.762	1.053+	0.313+
Social Responsive Scale 2						
1. social awareness						
Pre-intervention	19.63	2.247	19.69	2.869	0.069*	0.946*
Post-intervention	17.38	2.391	16.50	2.683	3.571+	0.069+
Follow-up	17.31	2.575	16.25	2.595	4.657+	0.039+
2. social cognition						
Pre-intervention	28.94	4.464	30.69	3.219	1.272*	0.213*
Post-intervention	24.25	3.992	25.69	3.049	0.015+	0.902+
Follow-up	24.38	3.862	25.56	3.140	0.026+	0.872+
3. social communication						
Pre-intervention	57.81	5.833	55.00	5.910	-1.355*	0.186*
Post-intervention	46.44	6.860	45.00	6.250	0.826+	0.371+
Follow-up	45.69	6.700	44.12	6.869	0.322+	0.575+
4. social motivation						
Pre-intervention	28.31	2.750	28.31	3.737	0.000*	1.000*
Post-intervention	24.19	2.949	23.87	3.243	0.190+	0.666+
Follow-up	23.44	3.464	23.63	3.160	0.039+	0.845+
5. limited interests and repetitive behaviors						
Pre-intervention	29.44	4.442	30.19	3.449	0.533*	0.598*
Post-intervention	25.69	4.936	25.44	4.098	1.709+	0.201+
Follow-up	25.69	4.799	24.88	4.455	2.996+	0.094+

*: based on independent - samples t-test
+: based on ANOVA

The results of the within group comparisons (Table 3) revealed that before the intervention, the two groups did not significantly differ in terms of auditory, visual, touch, movement, and oral processing, social-emotional responses associated with sensory processing, social awareness, social cognition, social communication, social motivation, and limited interests and repetitive behaviors, and occupational performance. However, the groups displayed significant differences in body position, conduct responses associated with sensory processing, attentional responses associated with sensory processing, sensory seeking, sensory avoiding, sensory sensitivity, and sensory low registration.

Covariance analysis was used to adjust for the baseline time scores and compare the post-intervention and follow-up scores of the two groups. The results showed that the intervention did not bring about any statistically significant difference between the two groups in their scores in the post-intervention tests nor their scores in the follow-up tests.

Discussion

A limited number of studies have been conducted on the impact of tele-occupational therapy interventions in different fields of occupational therapy, especially in Iran. The current study aimed to examine the effect of the family-based sensory diet program with and without tele-occupational therapy on sensory processing patterns, social competence, and occupational performance in children with ASD.

The results showed that the effectiveness of sensory diet program through in-person and tele-occupational therapy on sensory processing, social skills, and occupational performance in boys and girls with different levels of ASD are same, and gender and level of ASD have no effect on their effectiveness.

The COVID-19 pandemic has posed dramatic changes to people's lifestyles, and establishing and adjusting to a new routine has been quite stressful for everyone, especially children with ASD who are resistant to change. Environmental alterations, home modifications, and restricted accessibility to medical centers during the pandemic have had adverse impacts on children with ASD and their families. In a study by Nithya et al. (2021), 99% of respondents did not have access to medical centers and intervention facilities during the pandemic. Lack of access to structured environments during the spread of COVID-19 has led to the deterioration of ASD children's behavior. Thus, during such pandemics, it is required to offer healthcare services, especially occupational therapy, to these individuals and maintain treatment using alternative ways of therapy, such as tele consultation, by considering universal precautions [23]. In a study by Gibbs and Toth-Cohen (2011), four families of 5- to 12-year-old children with ASD participated in face-to-face clinic sessions followed by online sessions for six weeks, at least one session per week. The sensory diet was included, The results revealed that telerehabilitation was an efficient way of improving family-based programs for children with ASD as it provided collaborative occupational therapy services and offered great opportunities for families to ask questions, review sensory techniques, and understand the therapist's clinical reasoning [13]. In Vallefuoco et al.'s (2021) study, results confirmed the utility of this approach in improving various areas of healthcare for children with ASD [24]. In another study, Yılmaz and Önal (2021) examined the impact of tele-occupational therapy on sensory processing during the COVID-19 pandemic. The results of the sensory profile scale, used for evaluation, demonstrated the positive effects of telerehabilitation on vision, balance, touch, and multi-sensory processing. The authors suggested that when it came to conditions like the COVID-19 pandemic in which providing face-to-face occupational therapy was difficult, tele-occupational therapy would be an efficient alternative option. They also underscored the need for further research on tele-occupational therapy [25].

In this study the results showed that social awareness, social cognition, social communication, limited interests and repetitive behaviors, and social motivation were substantially altered over time. This results indicated that the family-based sensory diet program offered via tele-occupational therapy plays a critical role in improving the social competence of children with ASD level I and level II and has significant effect in improving the social competence of children with ASD through the time. The During the COVID-19 pandemic, social communication has considerably decreased, and children with ASD have had a greater tendency to be alone and socially isolated as compared to the pre-pandemic time [23]. In 2022, Jamali et al. investigated the effectiveness of providing occupational performance coaching using telerehabilitation for children with ASD. Occupational performance, parental self-efficacy, behavioral problems, and social behaviors were evaluated. The intervention group exhibited greater progress in these factors than the control group, suggesting that this intervention, carried out through telerehabilitation, considerably promotes children's occupational performance and parents' self-efficacy but does not affect children's social behaviors [14]. Based on the results of their systematic study, Dehghani et al. (2023) concluded that tele-occupational therapy was a promising technique for improving the behavioral problems of children with ASD [26]. Nonetheless, more studies were required to examine the role of telerehabilitation in behaviors developing feelings of empathy and sympathy in these individuals. In their study on online behavioral therapy, Marino et al. (2023) confirmed the significant impact of tele-occupational therapy systems on the social skills of children with ASD. However, they underscored that more approaches and resources were needed to establish and improve teleservices [25]. Shamsuddin et al. (2014) developed a telerehabilitation system as assistive therapy for children with various disabilities, including ASD, to give them access to robotic intervention in different places. In this system, different applications and pieces of software were installed on robots depending on the type of the child's disorder. The parents

were able to perform learning activities at home using these robots, and the video record of each session was assessed by the therapist [28]. This study argued that different stakeholders, including engineers, parents, doctors, and therapists, collaborate in a network to raise robotics technology and telecommunication. Boucenna et al. (2014) examined the use of communication technologies for children with ASD and reported that robotic systems, designed as interactive devices for children with ASD, were effective ways of assessing the children's responses to robotic behaviors, eliciting desired behaviors from them, modeling desired behaviors, teaching them a skill, offering opportunities for them to practice that skill, and providing constructive feedback on their performance in specific environments [29].

Occupational performance was significantly improved over time. But the interaction effect of time and groups was not significant, indicating that both groups had a similar increasing pattern. Both groups displayed similar occupational performance. Therefore, it can be stated that the family-based sensory diet program along with tele-occupational therapy plays an effective role in the occupational performance of children with ASD level I and II and the effect of sensory diet program through in-person and tele-occupational therapy have same effects during the time so these interventions can be used instead of each other on occupational performances of children with ASD. As mentioned earlier, Jamali et al. (2022) investigated the impact of occupational performance coaching through telerehabilitation on the occupational performance, behavioral problems, social behaviors, and parental self-efficacy of children with ASD. They found that the intervention group made greater progress than the control group and concluded that telerehabilitation, exerted a great influence on the children's occupational performance and parents' self-efficacy but not on the children's social behaviors[14]. Aqdassi et al. (2021) examined tele-occupational therapy through a movement program and concluded that this family-based program provided via tele-occupational therapy improved gross motor skills in these children and was useful for those who did not have access to rehabilitation centers [30]. Caprì et al. (2021) conducted a systematic review of telerehabilitation and concluded that such interventions were effective in elevating the adaptive skills of children and adults with multiple disabilities. The occupational therapy professionals and clients reported high levels of satisfaction and acceptance of telerehabilitation services. Although the results confirmed the remarkable impact of TR interventions on the adaptive skills of this group of clients, it was recommended that further studies be conducted on this type of intervention, especially in the area of genetic syndromes [10]. Tele-occupational therapy places a high value on family-centered practices, and based on the results of Cason (2011), these services are designed to enhance the children's development and quality of life. Telerehabilitation complements face-to-face services and promotes the quality and quantity of family-centered services [31].

In the current study, possible explanations for the reduction of deficits in the above mentioned factors are as follows: the families' high cooperation (One of the reasons for the high cooperation of these 32 families may have been that this program was free, and because of their poor financial status, they showed great inclination to participate in this free program).regular practice of activities, familiarity with the benefits of tele-occupational therapy services, and high willingness to participate in this free program due to their poor financial status. Based on the results obtained from the present study, it can be claimed that a family-based sensory diet program provided through tele-occupational therapy is as beneficial to the sensory processing pattern, social competence, and occupational performance of children with ASD as a sensory diet program offered via face-to-face occupational therapy.

Internet speed instability and the filtering (blocking) of virtual communication programs made the process of sampling longer than expected. Another problem was the low self-confidence of some families in using family-based techniques. One of the limitations of this study is the use of convenience sampling, which restricts the generalizability of the results.

Future studies can investigate parents' level of satisfaction with tele interventions and their

compliance with training. Other studies can be conducted on other age groups and other disorders.

Conclusion

Based on the results, it seems that the family-based sensory diet program offered through tele-occupational therapy is remarkably effective on the sensory processing patterns of children with ASD level I and level II. It seems that providing a sensory diet program through tele occupational therapy on sensory processing pattern, social competency and occupational performance is applicable as well as face-to-face occupational therapy in children with ASD.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Shahid Beheshti University of Medical Sciences (Code: IR.SBMU.RETECH.REC.1401.500), and it was registered at Iranian Registry of Clinical Trials (IRCT) (Code: IRCT20221128056651N2).

Authors' contributions

All the authors of the article contributed equally to the design, data collection, data analysis and writing of this article.

Conflict of interest

No conflict of interest.

Data availability statement

The data that supports the findings of this study are available in the supporting information of this article.

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