Research Article

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

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Citation Dehghani S, Pashmdarfard M, Pashazadeh Azari Z, Akbarzadeh Baghban A, Dehghani S, Mirzakhani Araghi N. Sensory Diet Program Through In-Person and Tele-Occupational Therapy in Children with Autism Spectrum Disorder: A Randomized Single-Blind Controlled Trial. Journal of Modern Rehabilitation. 2025; 19(1):30-40. http://dx.doi.org/10.18502/jmr.v19i1.17507

http://dx.doi.org/10.18502/jmr.v19i1.17507

Article info:
Received: 28 Mar 2024
Accepted: 21 Jul 2024
Available Online: 01 Jan 2025

Keywords:
Telerehabilitation; Sensory; Social behavior; Participation; Autism

ABSTRACT

Introduction: Autism spectrum disorder (ASD) is a sensory processing, social communication, and occupational performance disorder. Sensory diets can have positive effects on these fields. Current research compared the effectiveness of the sensory diet program with and without teleoccupational therapy on sensory processing patterns, social competency and occupational performance in children with ASD.

Materials and Methods: The study sample comprised 32 children with ASD 4-10 years old. They were placed in the control and intervention groups. The number of sessions for both groups was 20 30-minute sessions administered over 8 weeks. Through photos, videos, and explanations, sensory problems were described in both groups, the mother presented and implemented activities and environmental adaptations, and the therapist supervised the implementation. This study used three tools—sensory profile 2, social responsive scale 2 and Canadian occupational performance measure.

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 ($P<0.05$).

Conclusion: It seems that providing a sensory diet program through teleoccupational therapy on sensory processing patterns, social competency, and occupational performance is applicable, as well as face-to-face occupational therapy in children with ASD.

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Introduction

Autism spectrum disorder (ASD) is 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 are among 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]. de Vries and Geurts 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 various 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 using these services is a promising solution to providing rehabilitation interventions and promoting patients' quality of life. Studies have also revealed that integrating 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 teleoccupational 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. Studies have shown that compared to conventional treatments, this intervention significantly reduces sensory problems and raises child participation and parental competence in families.

Moreover, high levels of family acceptance were reported [12]. In a study by Gibbs and Toth-Cohen, the results demonstrate that telerehabilitation was a promising way of providing collaborative occupational therapy services and improving family-centered programs for children with ASD [13]. Considering the gaps mentioned above, the present study aimed to compare the impact of a family-based sensory diet program with and without teleoccupational 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. Levels 1 and 2 in ASD children were determined based on Gilliam's autism rating scale, 3rd edition (GARS-3). The ethical consent was obtained from the Shahid Beheshti University of Medical Sciences Ethics Committee and the trial was registered in the Iranian Registry of Clinical Trials. The mothers of the children signed the informed consent. The study was performed from June 2022 to April 2023.

Study participants

Children with level 1 and level 2 ASD were enrolled using convenience sampling from the autism rehabilitation centers in Tehran City, Iran. 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 faced 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: Being diagnosed with ASD by a child psychiatrist and of level 1 and level 2 ASD by an occupational therapist using the GARS-3, having an age range of 4 to 10 years, and not being diagnosed with other neurological disorders, such as epilepsy and other psychiatric disorders.

The inclusion criteria for the main caregivers were as follows: the mother's functioning as the main caregiver, having at least a diploma degree, having access to the Internet and VPN and 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, several exclusion criteria were also considered as follows: Absence for a maximum of three sessions, making changes in the program, or being unwilling to continue their participation in the study, partaking in other sensory programs.

Study procedure

Initially, thirty-two 4 to 10 year old children with ASD level 1 or 2 who were referred to the rehabilitation clinics in Tehran (the available samples) and met the inclusion criteria participated in this research. However, the study of all these subjects ceased. So, another inclusion criterion was added: The availability of a 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. A simple randomization method allocated the children to the experimental and control groups. 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 0.05 and the type II error of 0.2, the study power of 80% and estimating the mean (M) values of 1μ =3.4 and 2μ=5.4 and the standard deviations (SD) of 1σ=1.1 and 2σ =2.5 for the variable of occupational performance based on Jamali et al. study [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 6 sensory systems (auditory, visual, touch, movement, body position and oral sensory processing) and three behavioral parts (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 alpha values of 0.61 to 0.91 and the test-re-test reliability coefficients of 0.72 to 0.95 were reported for the Persian version [16].

Social responsiveness scale-2 (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 the completed questionnaire were reported as t scores (Mean±SD, 50±10) for the treatment subscales and the whole scale (as the total score). In addition, t scores ≥76 are considered severe impairment; t scores between 66 and 75 are considered moderate impairment, showing the presence of several noticeable social impairments and t scores between 60 and 65 are deemed mild impairment. Finally, t scores ≤59 indicate that a person probably has no clinically significant ASD problems. Mirzakhani Araghi et al. have reported the Cronbach 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: productivity, personal care, and leisure. Based on their importance, occupational performance problems are recognized and rated from 1 to 10 throughout the interview. Then, a score is given for each problem, considering occupational performance and satisfaction with occupational performance. A change of two points or higher due to the intervention is clinically deemed 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. and the psychometric properties of the Persian version were verified [20].

GARS-3

The GARS-3 scale was developed in 2014 to screen and diagnose 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

The children who received the sensory diet only through this program were included in this research. They continued attending their other programs, such as occupational therapy in mental health and play therapy. These programs were also checked to ensure that none involved sensory interventions or sensory integration sessions. Both control and intervention groups participated in twelve 30-minute sessions over 8 weeks. Two sessions were held per week in the first four weeks, whereas one was held per week in the second four weeks. 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 face-to-face occupational therapy (control group) and teleoccupational 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 therapist's supervision.

The face-to-face (control) group participated in 12 sessions for 8 weeks, 8 half-hour sessions in weeks one to four (two sessions per week), and 4 half-hour sessions in weeks 5 to 8 (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 or 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, twelve 30-minute sessions were held for 8 weeks, 8 half-hour sessions in weeks 1 to 4 (two sessions per week) and four half-hour sessions in weeks 5 to 8 (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 her implement the intervention, and identifying and amending her mistakes online. The mother followed the trained sensory diet thrice a week, each time for half an hour.

Overall, the mother attended two weekly meetings with the therapist 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 a follow-up test. As this study was a randomized, single-blind clinical trial, another occupational therapist familiar with these scales performed the first and third evaluations. The interventions provided in each session for the groups are presented in Table 1.

Statistical analysis

The Kolmogorov-Smirnov 1-sample test was used to check the normal distribution of the data. 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. The significance level was set to 0.05 in this study. Therefore, the $P \leq 0.05$ were considered statistically significant. Data were analyzed using SPSS software, version 18.

Results

Regarding gender, 11 boys and 5 girls were 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.

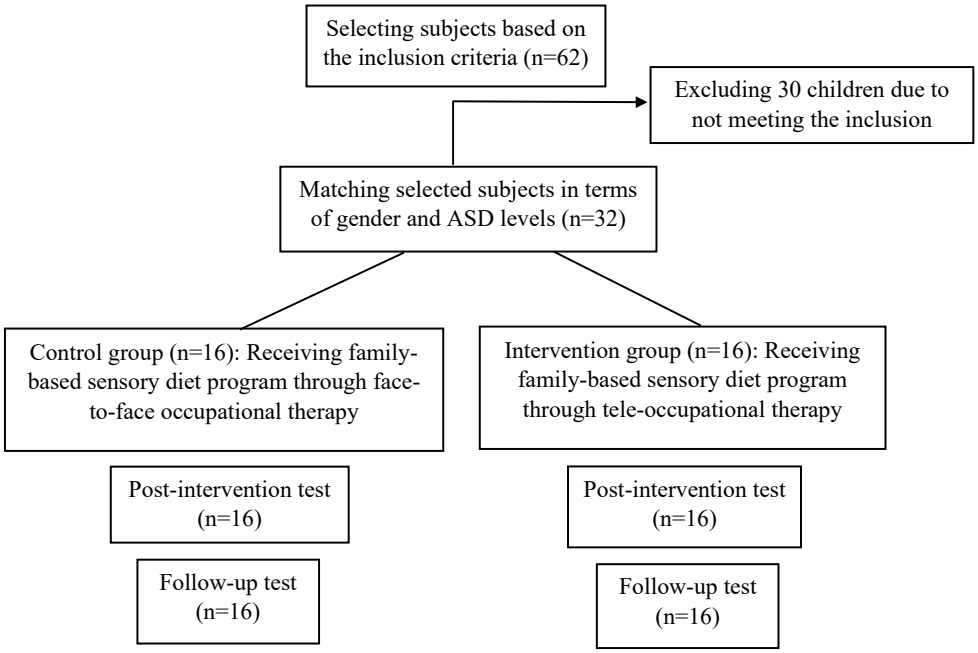

Figure 1. Sampling and intervention procedure in groups

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Table 2 provides the demographic characteristics of the children.

As shown in Table 2, the Mean±SD age of the subjects in the intervention group was 4.94±1.61 years. The subjects in the control group had a Mean±SD age of 5.13±1.63 years. 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.

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, and movement, as well as 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 or follow-up tests.

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

Week	Session	Interventions in FFG[&] and TG[&&]
1	1	Explaining the purpose of the study and the importance of the sensory diet program to the mother
1	2	Describing the areas in which the child has problems
2-4	3-8	Providing activities and environmental adaptations, which the mother then implemented under the supervision of the therapist
5-8	9-12	Error correction by the therapist and question-asking by the mother

FFG: Face-to-face group; TG: Telerehabilitation group.

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[&] At the Clinic, [&&]Through video calls on WhatsApp.

Table 2. Demographic characteristics of the participants (n=32)

Variables		No./Mean±SD	
		Control Group (n=16)	Intervention Group (n=16)
Age (y)		5.13±1.628	4.94±1.611
Sex	Male	11	11
	Female	5	5
ASD level	Level 1	11	11
	Level 2	5	5
Parental education	Associate or bachelor's degree	15	13
	Master's degree	1	3

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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 examined the effect of the family-based sensory diet program with and without teleoccupational therapy on sensory processing patterns, social competence and occupational performance in children with ASD.

The results showed that the effectiveness of sensory diet programs through in-person and teleoccupational therapy on sensory processing, social skills, and occupational performance in boys and girls with different levels of ASD are the 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, 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 efficiently improved family-based programs for children with ASD. 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 study, results confirm the utility of this approach in improving various areas of healthcare for children with ASD [24]. In another study, Yılmaz and Önal examined the impact of teleoccupational therapy on sensory processing during the COVID-19 pandemic. The results of the sensory profile scale used for evaluation demonstrate 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, teleoccupational therapy would be an efficient alternative option. They also underscored the need for further research on teleoccupational therapy [25].

This study shows that social awareness, cognition, communication, limited interests, repetitive behaviors, and social motivation substantially altered over time. These results indicate that the family-based sensory diet program offered via teleoccupational therapy plays a critical role in improving the social competence of children with ASD level 1 and level 2 and has a significant effect in improving the social competence of children

Table 3. The results of repeated measures ANOVA test

Measure		Mean±SD		Group Difference	
		Control Group	Intervention Group	Test Statistic	P
Canadian occupational performance measure					
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+

Measure		Mean±SD		Group Difference	
		Control Group	Intervention Group	Test Statistic	P
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. Ssocial 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 the independent samples t-test; +Based on ANOVA.

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with ASD over time. During the COVID-19 pandemic, social communication considerably decreased, and children with ASD 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. concluded that teleoccupational therapy was a promising technique for improving the behavioral problems of children with ASD [26].

Nonetheless, more studies are 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. confirmed the significant impact of teleoccupational 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 [27]. Shamsuddin et al. 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 could perform learning activities at home using these robots, and the therapist assessed each session's video record [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. examined the use of communication technologies for children with ASD. They 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. However, 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, the family-based sensory diet program along with teleoccupational therapy plays an effective role in the occupational performance of children with ASD levels 1 and 2 and the effect of sensory diet program through in-person and teleoccupational therapies are similar during the time so that these interventions can be used instead of each other on occupational performances of children with ASD. As mentioned earlier, Jamali et al. investigated the impact of occupational performance coaching through telerehabilitation on 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 greatly influenced the children's occupational performance and parents' self-efficacy but not the children's social behaviors [14]. Aqdassi et al. examined teleoccupational therapy through a movement program. They concluded that this family-based program provided via teleoccupational therapy improved gross motor skills in these children and was helpful in those who did not have access to rehabilitation centers [30]. Caprì et al. conducted a systematic review of telerehabilitation and concluded that such interventions effectively improved the adaptive skills of children and adults with multiple disabilities. The occupational therapy professionals and clients reported high satisfaction and acceptance of telerehabilitation services. Although the results confirmed the remarkable impact of telerehabilitation interventions on this group of clients' adaptive skills, further studies should be conducted on this type of intervention, especially in genetic syndromes [10]. Teleoccupational therapy places a high value on family-centered practices, and based on the results of Cason, these services are designed to enhance 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, a family-based sensory diet program provided through teleoccupational 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 when 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 teleinterventions and their compliance with training. Other studies can be conducted on other age groups and other disorders.

Conclusion

Based on the results, the family-based sensory diet program offered through teleoccupational therapy is remarkably effective on the sensory processing patterns of children with ASD level 1 and level 2. It seems that providing a sensory diet program through teleoccupational therapy on sensory processing patterns, 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 the Iranian Registry of Clinical Trials (IRCT) (Code: IRCT20221128056651N2).

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors express their gratitude to the children with ASD and their families.

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