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The Relationship Between Sensory-Processing Disorders and Sleep Disturbances in School-Aged Autistic Children in Shiraz, 2015

Sahar Ghanbari,[1,*] and Amin Rezaei[2]

[1]Department of Occupational Therapy, School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, IR Iran
[2]School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, IR Iran

*Corresponding author: Sahar Ghanbari, Department of Occupational Therapy, School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, IR Iran. E-mail: saghanbari@yahoo.com

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Abstract

Background: Autism is a neurological disorder that limits communication, socialization, and participation of children in symbolic play. Sensory processing disorders are common characteristics (45% to 96%) of children with pervasive development disorders, including. Sleep disorders are also more prevalent in autistic children than in normal children.

Objectives: This study aimed to investigate the relationship between sensory processing disorders and sleep disturbances in school-aged autistic children.

Patients and Methods: This study is quantitative, observational, and cross-sectional. 35 school-aged autistic children in Shiraz, Iran were selected using cluster sampling. A demographic questionnaire, short sensory profile (SSP), and the sleep disturbance scale for children (SDSC) were used. The Pearson correlation coefficient and Pearson chi-square were used during data analysis.

Results: Results shows that autistic children show clear differences from normal function (74.3%), possible differences with normal function (20%), and normal function (5.7%) in their total sensory processing scores. 95.3% of autistic children had some degrees of abnormal sensory processing disorder. Also, 68.6% of the participants suffered from sleep disorders. However, there was no relationship between sensory processing disorders and sleep disturbances in children with autism (P value = 0.83). Also, there was no correlation between the subscales of sensory processing disorders and the subscales of sleep disturbances.

Conclusions: The results showed that despite the simultaneous high prevalence of sleep disturbances and sensory processing disorders in children with autism, there isn't a significant relationship between the two conditions among these children.

Keywords: Child Pervasive Development Disorders, Sensory Processing Disorder, Sleep Disorders, Autism

1. Background

Autism is a neurological disorder that limits communication and participation of children in symbolic play (1). In the fourth edition of the Diagnostic and Statistical Manual (DSM-IV-TR), among the extensive collection of abnormal behavior seen in autism spectrum disorder (ASD), three key characteristics are introduced: qualitative impairment in social interaction, serious damage to communication, and repetitive, limited, and stereotyped behavioral disorder. Symptoms of the disorder appear before age three (2). According to the results, of every thousand people, 2 to 6 people have been diagnosed with the disorder (1). It is believed that autism is spreading. The disorder is four to five times more common in boys, and autistic girls suffer severe mental retardation (3). Biological factors are involved in the pathogenesis of this disorder, because seizure disorders and mental retardation are more common (4). The common view of most researchers in the field is that genetic factors play an effective role in the incidence of autism (2).

Sensory integration is a natural, neurological, and developmental process that begins in prenatal ages and continues throughout life and, but the most effective development occurs during the first 7 years of life. A sensory processing pattern is a bio-psychosocial phenomenon that is probably associated with genetic or biological factors (5). The evidence suggests that sensory processing patterns remain constant during the life (6). The successful completion of every activity in the life requires substantial sensory processing or sensory integration. Sensory processing disorder (SPD) or sensory integration dysfunction is a condition in which the sensory messages are not organizing the appropriate responses (7). The ability to process sensory information, including registration and modulation and the internal organization of this information, is necessary for successful behavior based on environmental demands, and ultimately results in meaningful participation in daily activities (8). While most people use this ability normally, some people also show extreme sensory patterns that can increase or decrease sensitivity to stimuli. Increased sensitivity to

sensory stimuli prompts some behavioral characteristics: discomfort in the face of sensory stimuli, cognitive and emotional tension, irritability, moodiness, anxiety, and hyper alertness (9-11).

Sleep disorders in children include insomnia, sleepiness, sleep-related breathing disorders, nightmares, waking disorders, rhythmic movement disorders, and urinary incontinence (12). The main sleep problems in children include daytime sleepiness, insomnia, difficulty falling asleep, difficulty staying asleep, and snoring (13). If sleep disorders in children are left untreated, they can lead to complications such as impaired attention and concentration, memory problems, and learning and behavioral disorders (12). For families with children and/or adolescents, sleep disorders can likewise influence social, emotional, and academic abilities (14).

Sleep disorders are particularly important in children with autism. First, children with autism who have worse nighttime sleep quality exhibit more behavioral problems. In addition, daytime sleepiness can affect children's behavior in training programs. Finally, the children's sleep problems disrupt the entire family's sleep, and can increase family stress and irritability during the day (15). The prevalence of sleep disorders in healthy children estimated between 25 and 40 percent (16), but during the investigations, the prevalence of sleep disorders in children with autism is estimated to be 44% to 83% (17).

One of the features of autism spectrum disorders is sensory processing disorder, the inability to maintain the integrity of sensory information and to respond appropriately to sensory stimuli. Various studies show that 45% - 96% of children with autism spectrum disorders suffer from these sensory problems (18). To extend a study conducted by Batya Engel-Yeger and Tamar Shochat to examine the relationship between sensory processing disorders and sleep quality in healthy adult subjects, we decided to examine this relationship in children with autism.

2. Objectives

The aim of this study was to determine the relationship between sensory processing disorders with common sleep disturbances in autistic children. To achieve this goal, we identified a variety of sensory processing disorders and sleep problems in autistic children.

3. Patients and Methods

This study is quantitative, observational, and cross-sectional. The data in this study were obtained through questionnaires completed by the parents of 35 school-aged autistic children (28 boys and 7 girls) in Shiraz, Iran. To collect the data, the cluster sampling method was used. Data were collected almost equally from four schools in different parts of the city. To do this research, we established some inclusion and exclusion criteria. Inclusion criteria were age from 3 to 12 years, parental consent to participate in the research, having medical records with a diagnosis of autism at school, and having no change in sleep-related prescription drugs in the past three months. Children with autism who also suffered from other psychiatric disorders, children with complex neurological disorders such as cerebral palsy and PKU, and children who had unstable medical condition, such as asthma, diabetes, and heart disease were excluded from the study. Some ethical considerations in this research included reassuring the studied families of their confidentiality, and taking into account and respecting their beliefs and traditions.

To collect background information, the researcher wrote a demographic questionnaire that asked the age and gender of the children, the number and ages of children in the family, and the occupation of the parents. To determine the presence of a sensory processing disorder, the short sensory profile (SSP) was used. The SSP is a questionnaire with 38 questions for caregivers, covering information on seven areas of sensory information processing (subscales), including tactile sensitivity, smell-taste sensitivity, sensitivity to movement, sensory seeking, auditory processing, weakness-low energy, and visual-auditory sensitivity. Three score estimate categories were established: clear difference with normal, possible difference with normal, and normal function, based on the total scores of each subscale and the sum of all subscales. The reliability of the original form of the questionnaire 95%, and a validity of 0.90 was obtained. Through Cronbach's alpha, a reliability of 0.74 was obtained for the Persian form of the questionnaire (19).

To measure sleep disorders in children with autism, the sleep disturbance scale for children (SDSC) questionnaire was used. The SDSC is a questionnaire completed by parents or caregivers. It investigates the occurrence of sleep disorders during the previous 6 months, and contains 26 items in a Likert type scale with values of 1 - 5 (higher numerical values reflect a higher frequency of symptoms). The sum of the scores provides a total sleep score with a possible range of 26 to 130. The subsets are disorders of initiating and maintaining sleep (DIMS); sleep breathing disorders (SBD); disorders of arousal (e.g. sleepwalking, sleep terrors, or nightmares) (DA); sleep-wake transition disorders (e.g. hypnic jerks, rhythmic movement disorders, hypnagogic hallucinations, nocturnal hyperkinesia, or bruxism) (SWTD); disorders of excessive somnolence (DOES); and sleep hyperhydrosis (SHY). The reliability and validity of the questionnaire were estimated to be 0.71 and 0.79, respectively (20). SPSS16 with descriptive and analytic statistics (chi square and Pearson correlation) was used for analyzing data with a significance level under 0.05.

4. Results

The participants' mean age was 9 ± 2.301 years old. Results show that the participants' sensory processing

scores had clear differences with normal (74.3%), possible differences with normal (20%), and normal function (5.7%). Thus, 95.3% of the children had some degree of abnormal sensory processing disorder. 68.6% of the participants suffered from sleep disturbances. To investigate the relationship between the qualitative elements of sleep disturbances and sensory processing disorders among the participants, a contingency table (Table 1) was drawn.

To find a significant relationship among these items, a Pearson chi square test was used to correlate sensory processing disorder and sleep disturbances (Table 2).

According to the results in the table, there is no significant relationship between sleep disturbances and sensory processing disorder.

To determine the relationship between subscales of sleep disturbances and SPDs, Pearson's correlation coefficient was used (Table 3).

According to the results of these correlation tests, there is no significant relationship between sleep disturbances and sensory processing disorders.

Table 1. The Relationship Between Sleep Disturbance and Sensory Processing Disorder Items in Autistic Children

Sensory Processing Disorder	Normal Function	Possible Differences	Clear Differences
Sleep Disturbances			
No Problem	0 (0)	4 (36.4)	7 (63.6)
Problem	2 (8.3)	3 (12.5)	19 (79.2)

Table 2. Correlation of Qualitative Sensory Processing Disorder and Sleep Disturbance Items

Correlation	Significant Level	df	Value
Pearson Chi Square	0.191	2	3.309

Table 3. The Relationship Between Subscales of Sleep Disturbances and Subscales of Sensory Processing Disorders in Autistic Children[a]

Variable	DIMS	SBD	DA	SWTD	DOES	SHY	Sleep Disturbances
Tactile Sensitivity	(0.504) 0.12	(0.11) 0.28	(0.21) 0.22	(0.71) - 0.65	(0.8) - 0.048	(0.568) - 0.08	(0.604) 0.08
Smell-Taste Sensitivity	(0.67) - 0.07	(0.39) 0.15	(0.12) 0.27	(0.362) - 0.16	(0.55) 0.104	(0.56) - 0.1	(0.93) 0.016
Sensitivity to Movement	(0.7) - 0.07	(0.94) 0.013	(0.47) 0.13	(0.6) - 0.101	(0.99) - 0.003	(0.145) - 0.25	(0.756) 0.054
Sensory Seeking	(0.473) - 0.13	(0.84) - 0.03	(0.51) - 0.12	(0.13) - 0.26	(0.7) - 0.63	(0.78) - 0.05	(0.41) - 0.14
Auditory Processing	(0.67) - 0.07	(0.89) 0.024	(0.95) - 0.012	(0.64) - 0.08	(0.79) - 0.05	(0.45) 0.133	(0.86) - 0.031
Weakness- Low Energy	(0.71) - 0.07	(0.56) 0.103	(0.34) 0.17	(0.58) 0.09	(0.89) 0.024	(0.4) - 0.15	(0.69) 0.07
Visual- Auditory Sensitivity	(0.24) - 0.21	(0.83) - 0.04	(0.62) - 0.09	(0.11) - 0.28	(0.31) - 0.18	(0.15) - 0.25	(0.22) 0.214
Sensory Processing Disorders	(0.75) - 0.06	(0.49) 0.12	(0.45) 0.13	(0.36) - 0.16	(0.92) - 0.017	(0.37) - 0.16	(0.83) - 0.39

[a](P value)-correlation coefficient.

5. Discussion

According to the results of this study, the overall prevalence of sleep disturbances among 35 school-aged children with autism in Shiraz was 68.6%, on the basis of the SDSC. Previous studies that have reported similar results. Najafi et al. (21) (2013) reported that 70% of 55 autistic children in the Isfahan autism center had sleep disorders, as measured by the children's sleep habits questionnaire (CSHQ) and Actigraph. Similarly, a study by Souders et al. (22) (2009) estimated that the prevalence of sleep disorders in children with autism was 62.5%. Liu et al. (23) (2006) estimated that 86% of children with autism had sleep disorders based on the CSHQ. However, some other studies reported a considerably lower prevalence of sleep disorders in children with autism. In a study by Sivertsen et al. (24) (2012), the prevalence of chronic sleep disorders in 28 children with autism was reported at 39.6%. In another study, which was conducted by Goodline-Jones (2008), the prevalence of sleep disorders in a similar group of children was 41% (25). In explaining such inconsistencies, it can be pointed out that in some studies, autistic children are classified into high and low function groups. Additionally, there are differences in research implementation and questionnaires used and the age range of the studies. The present study also found that 95.3% of autistic children had some degree of abnormal sensory processing disorder. Tomchek and Dunn reported a similar prevalence of sensory processing disorders, 95%, based on an investigation of 281 children with autism spectrum disorders (26).

The results of this study showed that there is no sig-

nificant relationship between sensory processing disorders and sleep disturbances in children with autism. A previous study conducted by Mazurek and Petroski on 1374 children with autism spectrum disorders used the CSHQ and the SSP, and found a correlation between sensory over-responsiveness and sleep problems in these children (27). In explaining this discrepancy, it can be noted that Mazurek and Petroski (27) used the high/low function division (we did not), had a larger sample size, used a different sleep questionnaire, and surveyed a different age range. A study by Engel-Yeger and coworkers on healthy adults showed that sensory processing disorders that are characterized by hypersensitivity were associated with sleep quality. In fact, there was a correlation between sleep quality and a low sensory threshold. It is possible that the parents in our research may have ignored their children's sleep behaviors, or they may not be aware enough of the importance of sleep and its impact on the daily functioning of these children (28). In another study conducted by Roth on 22 infants aged 1.7 to 12.9 months, the results indicated that infants' looking behavior decreases as sleep problems increase. Roth suggested that by providing age-appropriate sensory stimulation through a sensory diet, the sleep problems would be reduced (29).

This study is the first research designed to investigate the relationship between sensory processing disorders and sleep disturbances in autistic children. Limitations in this study included a lack of enough Persian and English research resources, difficulty in coordinating the survey responses, bureaucratic delays, and incomplete or missing questionnaires. We do suggest using a larger sample size for future studies of this relationship. IQ tests and categorizing autistic children as high and low function before collecting the data could also help produce more accurate results.

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Footnote

Authors' Contribution: The study conception and design were done by Sahar Ghanbari. Acquisition of data, analysis and interpretation of data, and drafting of the manuscript were done by Amin Rezaei, and critical revisions were done by both Sahar Ghanbari and Amin Rezaei.

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