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 Mohammad Abed Sakarneh¹
ORCID: 0000-0001-8683-7941

 Obaid Abdalkarim Sabayleh²
ORCID: 0000-0003-4167-6499

 Abdel Latif Khalaf Alramamneh³
ORCID: 0000-0002-8789-7898

The Sensory Characteristics of Children with Autism Spectrum Disorder: Teachers' Observation

Abstract

The study aimed to identify the sensory characteristics of children with autism spectrum disorder (ASD) as estimated by their teachers. Descriptive surveying approach was used to suit the nature of the study. The researchers selected a simple random sample consisting of (40) teachers from (6) centres for autistic children in Amman, Jordan. The tool used in this study was a checklist consisted of 38 items. The collected data were analysed and then expressed through means and standard deviations. In addition, t-test was used to determine significance of the differences. The results revealed that the sensory characteristics of children with ASD were often evident in the study sample. The characteristics of children with ASD in the sensory domain were ranked as follows: First; tactile stimuli, second; olfactory and tasting stimulants, third; visual stimuli, and finally the auditory stimuli. The results showed that there were no statistically significant differences in the study sample attributed to age except the tactile stimuli and the differences were in the favour of age (3-6). Implications and recommendations are presented.

Keywords: children, autism spectrum disorder, sensory characteristics, special education teachers, DSM-5.

Introduction

Autism spectrum disorder (ASD) is a developmental disability defined by diagnostic criteria that include deficits in social communication and social interaction, and the presence of restricted, repetitive patterns of behaviour, interests, or activities that can persist throughout life (American Psychiatric Association, 2013). In 2018, the Centres for Disease Control and Prevention issued their ADDM autism prevalence report. The report concluded that the prevalence of autism had risen to 1 in every 59 births in

the United States – twice as great as the 2004 rate of 1 in 125 – and almost 1 in 54 boys (Baio et al., 2018). It is considering as an international alert to focus and give an attention in terms of diagnosis, assessment, education, training, treatment, early intervention and rehabilitation to this category of disabilities. According to Act of Education of Persons with Special Educational Needs and the Jordanian Law on the Rights of Persons with Disabilities, autism spectrum disorder has been seen as a separate disorder. Its diagnosis requires assessment of the child's condition by a

¹ PhD., Al-Balqa Applied University, Princess Rahma University College, Department of Special Education, Al-Salt, JORDAN.

e-mail: msakarneh@bau.edu.jo

*Corresponding author

² PhD., Al-Balqa Applied University, Princess Rahma University College, Department of Special Education, Al-Salt, JORDAN.

³ PhD., Al-Balqa Applied University, Princess Rahma University College, Department of Special Education, Al-Salt, JORDAN.

multidisciplinary team comprising a neurologist, a psychologist, a psychiatrist, a paediatrician, a language specialist, a speech therapist, an occupational therapist and an educational specialist (Zureiqat & Imam, 2007).

In 2013, the American Psychiatric Association (APA) issued the fifth new version of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*, which resulted in changes in the diagnosis of some psychiatric illnesses that differ from the previous *DSM-IV-TR (2000)* (American Psychiatric Association, 2013; Kulage, Smaldone, & Cohn, 2014). According to the above-mentioned manual and in addition to the core deficits that have been indicated in the above definition, the sensory characteristics included in more details and included in the criteria for ASD for diagnosis. The common characteristics – according to the *DSM-5* – are difficulties in social interaction, communication, rigidity and repetitiveness (American Psychiatric Association, 2013). The most described features as well as the neuro-typical features include "tactile sensitivity, auditory filtering and visual processing" (Muratori, Tonacci, Billeci, Catalucci, Iglizzi, Calderoni & Narzisi, 2017, p. 3243).

The social interaction difficulties were confirmed by several researchers who stated that these difficulties are caused by sensory features which was found in the children with ASD with a percentage of 69%-95% (Baranek, David, Poe, Stone, & Watson, 2006; Dugas, Simard, Fombonne, & Couture, 2018; Glod, Riby, Honey, & Rodgers, 2015; Hazen, Stornelli, O'Rourke, Koesterer, & McDougale, 2014; Schaaf & Lane, 2015). Schaaf and Lane (2015) in their literature review focused with more details on the sensory features associated with ASD which cause social development and interaction due to the surrounding social environment as they considered these features as core symptoms of children with ASD (Schaaf & Lane, 2015). According to Dugas et al. (2018) different sensory features were cited such as "atypical hearing reactivity, tactile hyperactivity, and gustatory, olfactory hyperactivity, weakness of endurance and tonicidity that could indicate atypical proper inceptive reactivity" (p. 2).

Probably more research from the medical perspective have been done in this area, but less research –from educational perspective– has been conducted. It has been reported that these sensory char-

acteristics can influence student behaviour during the teaching- learning process (Caplan, Feldman, Eisenhower & Blacher, 2016; Sakarneh, 2014a). Sensory characteristics of children with ASD may also hinder their interaction and restrict them from acting effectively during their communications with others (Dugas et al., 2018; Samson, Phillips, Parker, Shah, Gross, & Hardan, 2014; Tomchek & Case-Smith, 2009; Watson, Patten, Baranek, Poe, Boyd, Freuler, & Lorenzi, 2011). Sensory characteristics can manifest during the school day, which consume half of the learning time of children with ASD's. Therefore, teachers and other educational stakeholders are considered to be observers, interveners and behaviour modifiers to guarantee that teaching and learning process goes smoothly and productively (Sakarneh, 2015; Sakarneh, Paterson & Minichiello, 2016) Otherwise, the relationship between teachers and students with ASD will be negatively affected (Caplan et al., 2016; Sakarneh, 2014b). Consequently, it is important to explore the types of sensory characteristics so that teachers and other educational stakeholders could consider these characteristics and introduce them to other researchers from different scientific research backgrounds as ground-based observations by teachers.

As mentioned above, most of the research in the field of sensory characteristics on children with ASD has been conducted by researchers with medical and more specific neurological backgrounds. For instance, in the latest study conducted by Posar and Visconti (2018) to explore the main features of sensory abnormalities in children with ASD, the researchers in summarizing the previous studies in the field, found that the research cited the most common features which were hypo-responsiveness, hyper-responsiveness, sensory seeking and enhanced perception. To compare tools of research in the area of sensory features of children with ASD, research found that observations and questions are valid and congruent in exploring the presence of sensory reactivity symptoms (Tavassoli, Bellesheim, Siper, Wang, Halpern, Gorenstein, Grodberg, Kolevzon & Buxbaum, 2016). A study by Yasuda, Hashimoto, Nakae, Kang, Ohi, Yamamori, Fujimoto, Hagihira and Takeda (2016) found that fifteen individuals with ASD reacted to pain in three different stimuli; cold, heat and

electricity. Their tools were the visual analogue scale (VAS and the short-form McGill Pain Questionnaire). Another study conducted by Green, Chandler, Charman, Simonoff & Baird, (2016) aimed at comparing groups of children with ASD with other special educational needs categories to examine the applicability of new criteria in DSM-5 in terms of responsiveness to sensory stimuli among these groups. The sample consisted of 116 children with ASD and 72 children without ASD. The researchers reported that atypical sensory behaviour was found in 92 % of ASD especially with severe ASD and 67 % of other categories of special education needs. Other researchers tried to classify children with ASD based on their sensory subtypes in a sample of 228 aged 2-10 years (Lane, Molloy & Bishop, 2014). Moreover, four sensory subtypes were extracted; sensory adaptive, taste smell sensitive, postural inattentive and generalized sensory difference. According to the study, these subtypes – clinically- can be clustered into two main groups in relation to their effect on the children with ASD that are: sensory hyperactivity; and difficulties with multi-sensory processing which by the process of early intervention can be more effective (Lane et al., 2014). To confirm types of sensory in children with ASD, a survey study involved caregivers conducted online by Ausderau, Sideris, Furlong, Little, Bulluck and Baranek (2014). The sample consisted of 1307 caregivers of children with ASD aged 2-12 years using Sensory Experiences Questionnaire Version 3.0 with a confirmatory factor analytic model with four substantive factors of hypothesized sensory response patterns (hyper-responsiveness; hyper-responsiveness; sensory interests, repetitions and seeking behaviours; enhanced perception). The results confirmed the mentioned four factors regardless of the child age, sex or economic background. Other types of cross-cultural studies relied on qualitative methods to understand deeply the symptoms of ASD in different ages (Chamak, Bonniau, Jaunay & Cohen, 2008). The study reported that the core ASD symptoms were atypical perceptions and processing of sensory information and abnormal emotional regulation (Chamak et al., 2008). These symptoms can be stable under the age of six, which can help parents, therapists, teachers in detecting and improving functional and psychosocial out-

comes (Repetto, Jasmin, Fombonne, Gisel & Couture, 2017).

Moving from general concepts of sensory features to more specific sensory terms, for auditory sensory, most of the research reported that the individuals with ASD confront difficulties (Ben-Sasson, Cermak, Orsmond, Tager-Flusberg, Carter, Kadlec & Dunn, 2007; Greenspan, Weider, 1997; Tomchek & Case-Smith, 2009) either auditory hypersensitivity (Bettison, 1994; Gillberg & Coleman, 1996) or under-responsivity (Baranek, 1999; Osterling & Dawson, 1994) and some having reasonable auditory discrimination (Jones, Happé, Baird, Simonoff, Marsden, Tregay, Phillips, Goswami, Thomson & Charman, 2009). For visual sensory, eye contact of individuals with ASD was early documented. Studies showed that children with ASD avoid contacting others and it is a recognized visual sensory feature (Baranek, 1999; Gillberg & Coleman, 2000; Kientz & Dunn, 1997 & Sabatos-DeVito, Schipul, Bulluck, Belger, & Baranek, 2016). Tactile also reported in the early literature as one of the sensory features of individuals with ASD (Baranek, Foster, & Berkson, 1997; Ben-Sasson, Hen, Fluss, Cermak, Engel-Yeger, Gal, 2009). In addition, studies found that children with ASD are sensitive to touch and they feel uncomfortable, confused, distracted and react abnormally (Baranek et al., 1997; Cesaroni & Garber, 1991). Individuals with ASD are under-sensitive in olfactory and having difficulties in identifications, which is related to "peripheral or cortical olfactory structures level" in the brain (Muratori, Tonacci, Billeci, Catalucci, Iglizzo, Calderoni, & Narzisi, 2017, p. 3244).

The importance of the current study is that it is one of the first studies that examined the issue of the sensory features of children with ASD, as most studies was conducted on the fourth manual and there are no studies-as far as the researchers know- in the region on the fifth manual in regarding the sensory features. The new diagnostic criteria of ASD have been reported to be more accurate and more useful in medical and scientific terms regarding to diagnosis of individuals with ASD. The pre-diagnostic features of the autism spectrum disorder mentioned, in the fourth edition of the manual have been criticized by some specialists (Herman, 2000; Marshall, Spitzer, Liebowitz, 1999; Rounsaville, Alarcón, Andrews, Jackson, Kendell, Kendler,

2002). Therefore, teachers, researchers and parents of children with ASD in Jordan may make use of this study.

The process of detection and identification of the sensory features of the child with ASD is considered very important in terms of their diagnosis. The diagnosis of this category has to be built on different criteria and should be based on accurate measurements to identify it correctly. Such diagnostic tools are supposed to have psychometric features such as the manual (DSM-5). The American Psychiatric Association (APA) has published the manual, which has been confirmed for its validity and reliability (Rellini, Tortolani, Trillo, Carbone, & Montecchi, 2004.) Some individuals who were previously diagnosed with developmental disorders (such as autism) due to some other diagnostic tools may not now be diagnosed with autism disorder when using the most accurate diagnostic features in the new released version of DSM (Rellini et al., 2004). This may be particularly useful for children with attention deficit hyperactivity disorder, who have minor problems with social skills who have been diagnosed with autism disorder in fact (Rellini et al., 2004). The current study is designed to identify the sensory features of children with autism spectrum disorder assessed by teachers by applying the DSM-5 criteria to a group of children with ASD and specifically to answer the following questions:

- What are the sensory features of children with autism spectrum disorder?
- Do teachers' estimates sensory characteristics of children with ASD differ according to the child's age?

Method

The researchers used a descriptive survey method. The study population consisted of teachers and children with ASD in Amman, Jordan. The researchers chose a simple random sample that consisted of (40) teachers from (6) centres for children with ASD in Amman, Jordan.

Participants

The participants in the current study were 40 teachers working in 6 autism centres in

Amman city. Table (1) shows the demographic information of the participants. For confidentiality considerations, the participated centres were given numbers as it can be seen in the table. The children's ages ranged between 3-10 years. Autism centres in Jordan usually accept children with ASD under formal diagnostic measurements, which include medical comprehensive diagnosis and other aspects of diagnosis such as intelligent quotient, adaptive behaviour, language and speech disorders, psychology and educational assessment. Such comprehension diagnosis usually conducted in the National Centre for Early Disabilities Diagnosis, which follows to the Jordanian Ministry of Health. For example, the specialists in the mentioned centre use international standardised diagnostic scales and checklists such as the Autism Behavioural Checklist. Therefore, the child with ASD has to be referring by the National Centre for Early Disabilities Diagnosis. Teachers who work in autism centres must have a special education qualification and have ability to work with ASD under general supervision of the Ministry of Social Development.

Instrument

The researchers developed a survey checklist using two types of resources; the first one was the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) by extracting the items that measure the sensory characteristics of ASD (American Psychiatric Association, 2013), whereas the second resource was the literature related to the topic (mentioned in the introduction). The checklist in its final draft consisted of (38) items that covered four dimensions of the sensory characteristics, namely: Tactile Stimuli, Olfactory and Tasting Stimuli, Visual Stimuli and Auditory Stimuli. The researchers defined the degree to which a child with ASD is diagnosed according to DSM-5 and the related literature in the features of auditory stimuli, tactile stimuli, visual stimuli and olfactory and tasting stimuli. Each item was observed by using a 5-point Likert-type scale that ranged from 5: always, 4: often, 3: sometimes, 2: seldom and 1: never. This means that the minimum score will be 38 and the maximum score will be 190.

Table 1.
Demographic of the Participants

Centre's Number	Number of Teachers	Teacher's Qualification	Years of Experience	Teachers' Gender	Number of Students in the Centre
1	4	Bachelor/Special Education	4	Female	25
	2	Bachelor/Special Education	5	Female	
2	2	Bachelor/Special Education	6	Female	20
	3	Bachelor/Special Education	3	Male	
3	2	Graduate Diploma/ Special education	7	Male	23
	4	Bachelor/Special Education	4	Female	
4	6	Bachelor/Special Education	2	Female	36
	2	Graduate Diploma/ Special education	5	Male	
5	5	Bachelor/Special Education	2	Female	32
	2	Bachelor/Special Education	4	Female	
6	6	Bachelor/Special Education	3	Female	40
	2	Graduate Diploma/ Special education	6	Female	
Total	40				176

Validity and Reliability

The initial draft of the study instrument was written in English before it was translated into Arabic as the first draft consisted of 45 items. After the translation of the checklist into English, the researchers asked an independent English Language specialist (translator) for proofreading who made some changes in the translated version. In order to ensure the validity of the instrument, the researchers ensured the validity of the Arabic version of the instrument by consulting a group of five referees who are specialized in the field of special education at two Jordanian universities; Jordan University and Al-Balqa Applied University. Their role was to confirm whether the content of the instrument was accurate and adequate in terms of language clarity, check the relevance of each item to the related dimension, which is part of the main checklist and to provide any additional comments or corrections. Changes were made according to the recommendations and notes of the validation panel. The checklist was revised according to their feedback by omitting, adding or rephrasing some items, decreasing the number of items from 45 to 38 and then were distributed on the previous dimensions. In order to estimate the reliability of the checklist, internal consistency measures were computed using Cronbach's alpha. The reliability coefficient obtained was 0.80, which is considered sufficient for the purpose of the study.

Ethical considerations

The children and the teachers, who participated in the study, were informed by the

researchers about the aim of the study and that their participation and responses will be treated confidential and their names will be kept anonymous. The parents signed a consent form. The study protocol was reviewed and approved by the institutional review board in Al-Balqa Applied University where the researchers belong to. The Ministry of Social Development issued an approval letter to the targeted centres.

Data collection

After explaining the purpose of the study, the researchers distributed the checklist among the teachers of the children with ASD through the participated centres at the beginning of the second semester of the 2017–2018 academic year. All of these centres are private but under the supervision of the government through the Ministry of Social Development. The Ministry of Social Development identified all these centres, as the Ministry is the main body that authorised and follow up these centres. The researchers encouraged and politely asked the participants to read the checklist carefully and fill it appropriately. Instructions of the study tool were given to the participants to ensure that they understand how to fill the checklist.

Data analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22 to find the means and the standard deviations of the sample responses to the first and second question. In addition to that, T-test was used to analyse the results of the second question to see if there are any variances to determine significance of

the differences as the children's age divided into two groups; 3-6 and 7-10.

Results

To answer the first research question: what are the sensory features of children with ASD? The researchers used the means and standard deviations of the sample responses of the study as shown in Table (2).

As shown in the above table, the estimates of the study sample for the sensory characteristics of children with ASD were averaged (3.67) and indicated that they were present in children with ASD at an estimated (often). The tactile stimuli ranked

first with an average of (4.53), features of Olfactory and Tasting Stimuli with an average of (3.50), features of Visual Stimuli came third with an average of (3.36), and features of Auditory Stimuli came fourth with an average of (3.30). This indicates that the diagnostic evidence contributes significantly to the determination of the sensory characteristics of children with ASD as estimated by the teachers. To illustrate the responses to each dimension of the study, the researchers used the means and the standard deviations for each dimension. Tables (3, 4, 5 and 6) present the results.

Table 2.
The Means and Standard Deviations of the Sample Responses of the Study

Number	Dimension	Mean	SD	Response
1	Features of Tactile Stimuli	4.53	0.89	Always
2	Features of Olfactory and Tasting Stimuli	3.50	0.81	Often
3	Features of Visual Stimuli	3.36	0.97	Often
4	Features of Auditory Stimuli	3.30	0.98	Often
Total		3.67	0.91	Often

Table 3.
Features of Auditory Stimuli

N	Item	Mean	SD	Response
1	Get upset by some sounds that are not considered high	3.90	0.92	Often
2	He puts his hands on his ears when he hears any sound that bothers him	3.51	0.97	Always
3	Hears sounds not heard by others (excessive hearing sensitivity)	3.50	0.99	Always
4	Does not respond to high sounds (low audio sensitivity)	4.49	1.035	Always
5	Shows that he does not hear anything (such as deaf children)	4.29	1.16	Always
6	It is attracted towards specific types of music	4.28	1.09	Always
7	He does not respond to his name when he Called	4.23	1.06	Always

Table 4.
Features of Tactile Stimuli

N	Item	Mean	SD	Response
1	Excessive responses towards touching others	3.90	1.12	Often
2	He avoids being touched by anyone	4.43	1.16	Always
3	He avoids being hugged by anyone	4.38	1.13	Always
4	Keep away from others if they approach him	4.15	1.18	Always
5	Not feeling any sense of touch	4.12	1.14	Always
6	Do not feel pain when hurt	4.09	1.19	Always
7	Enjoying games based on physical contact	4.08	1.25	Always
8	Do not feel pain when falling hard	4.75	1.20	Often
9	He does not feel pain when he is injured	4.70	1.16	Always
10	Avoid touching some surfaces	4.60	1.14	Always
11	Avoid wearing some clothes	4.40	1.12	Always
12	Avoid shaking hands with others	4.43	1.16	Always

Table 5.
Features of Visual Stimuli

N	Item	Mean	SD	Response
1	He has difficulty seeing some visual stimuli	4.10	0.97	Always
2	Avoid seeing some colors	4.01	1.01	Always
3	It makes you feel that he is seeing invisible things	3.99	0.99	Often
4	Avoid visual communication with others	3.91	1.02	Often
5	Staring for a long time in a space or specific something	3.71	1.05	Often
6	Avoid some lights	3.45	1.17	Often

Table 6.
Features of Olfactory and Tasting Stimuli

N	Item	Mean	SD	Response
1	Tends to smell exotic odors	4.45	1.17	Always
2	Sniffing People before starting to communicate with them	4.45	1.20	Always
3	Smells the people's hair	4.39	1.13	Always
4	Tends to unusual foods	4.36	1.15	Always
5	prefer eating one kind of food for a long time	4.39	1.20	Always
6	Licking things with his tongue	4.20	1.20	Always
7	Put his clothes or bed covers or curtains in his mouth	3.45	1.17	Often
8	Hate specific kinds of food extremely	3.45	1.20	Often
9	Recognize medicinal drugs in food or juice	3.39	1.13	Often

Answering the second research question: Do teachers' estimates of sensory characteristics of children with ASD differ according to child's age?

The researchers used the mean and standard deviations and t-test according to the age variable. Table (7) shows the results.

Table (7) shows that there were no statistically significant differences in the response of the study sample attributed to the children with ASD' age except for the tactile stimuli. The differences were in the favour of age 3-6.

Discussion

In general, the results revealed that there were overall indications of impairments in the sensory stimuli in children with ASD. These results are consistent with previous literature conducted in this arena (Ausderau et al., 2014; Chamak et al., 2008; Dugas et al., 2018; Kientz & Dunn, 1997; Posar & Visconti, 2018; Samson et al., 2014; Schaaf & Lane, 2015; Tomchek & Case-Smith, 2009; Watson et al., 2011) and confirmed the criteria of the sensory characteristics in the DSM-5. However, the features of auditory stimuli came fourth among the four dimensions and this was in contradiction

with most of the studies which found that the auditory stimuli difficulties is the most common feature by which children with ASD can be recognized (Baranek, 1999; Bettison, 1994; Gillberg & Coleman, 1996; Greenspan, Weider, 1997; Osterling & Dawson, 1994; Tomchek & Case-Smith, 2009). Features of tactile stimuli scored high among the four dimensions and this result is consistent with some studies (Baranek et al., 1997; Cesaroni & Garber, 1991) but not in such order as most of the research conducted involving three common perceptions and their findings- respectively- were; auditory, visual and tactile impairments (Schaaf & Lane, 2015).

Moreover, the results showed that there were no statistically significant differences in the response of the study sample attributed to the age of children with ASD's except for the tactile stimuli. The result is inconsistent with some studies (Repetto, Jasmin, Fombonne, Gisel & Couture, 2017) as the mentioned study reported that ASD symptoms are stable under the age of six. However, it compatible with some research, as Ben-Sasson et al. (2009) reported that sensory features increased from 0 to 6 years; peaked at ages 6–9 years and declined after 9 years of age.

Table 7.
Results of T-Test of The Responses of the Study Sample According to the Age Variable of Children with ASD

Features / Age	3-6		7-10		T	Actual significance level	Significant at $\alpha = 0.05$ level
	Mean	SD	Mean	SD			
Tactile Stimuli	29.320	4.07	26.561	4.35	1.054	0.01	Significant
Olfactory and Tasting Stimuli	20.870	4.47	20.96	5.59	4.048	0.10	Not Significant
Visual Stimuli	23.960	6.64	24.01	7.10	0.82	0.051	Not Significant
Auditory Stimuli	28.670	8.065	29.07	9.43	2.36	0.28	Not Significant
Total	102.82	47.76	107.89	39.24	3.32	0.07	Not Significant

Conclusion, Implications and Recommendations

The current study aimed at detecting and identifying the sensory characteristics of the child with ASD. It can be concluded that there are a ground applications of the DSM-5 criteria and this criteria is observable in the centres of the ASD. Therefore, the different perspectives of the sensory features in children with ASD are congruent. Based on the findings of the study, a priority should be given to the measurement and evaluation of tactile stimuli of children with ASD. In more practical terms, educational stakeholders are recommended to apply different behavioural modification programs focusing in developing tactile stimuli in children with ASD and considering the tactile sensory stimuli of autism spectrum disorders when developing an individual therapy program. In addition of that, there are a necessity of developing a programs of treatment based on sensory integration to develop the sensory features of children with ASD. Moreover, more focus should be given to the social integration of children with autism spectrum disorder to reduce the sensitivity of the touch. The diagnosis of children with ASD must be built on different criteria and should be based on accurate measurements to identify it correctly especially before the age of 3 years. It can be suggested that future directions of research in this area could be focus on exploring the correlation between the sensory features and daily life skills of children with autism spectrum disorder.

Limitations of the Study

The study has some limitations restrict it from generalizations. The study sample was selected from the autism centres in the capital governorate, Amman. The sample of the study was limited to groups of children whose age ranges between (3 - 10) with ASD. The study was limited to the sensory characteristics of children of ASD in autism centres in Amman. The generalization of results is limited to the extent to which the sample of the study responds to the checklist used in this study.

References

- American Psychiatric Association (2013), Diagnostic and statistical manual of mental disorders, 5th ed. Arlington, VA: American Psychiatric Publishing Inc.
- Ausderau, K., Sideris, J., Furlong, M., Little, LM., Bulluck, J. & Baranek, GT. (2014). National survey of sensory features in children with ASD: factor structure of the sensory experience questionnaire (3.0). *Journal of Autism and Developmental Disorders*, 44 (4), 915-925. <https://doi.org/10.1007/s10803-013-1945-1>.
- Baio J, Wiggins L, Christensen DL, et al. Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2014. *MMWR Surveill Summ* 2018; 67 (No. SS-6):1–23. DOI: <http://dx.doi.org/10.15585/mmwr.ss6706a1> Baranek, G. T.,
- Foster, L. G., & Berkson, G. (1997). Tactile defensiveness and stereotyped behaviours. *American Journal of Occupational Therapy*, 51(2), 91–95. <http://dx.doi.org/10.5014/ajot.51.2.91>.
- Baranek, G. T., David, F. J., Poe, M. D., Stone, W. L., & Watson, L. R. (2006). Sensory Experiences Questionnaire: Discriminating sensory features in young children with autism, developmental delays, and typical development. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 47 (6), 591–601. <https://doi.org/10.1111/j.1469-7610.2005.01546.x>.
- Ben-Sasson, A., Cermak, S. A., Orsmond, G. I., Tager-Flusberg, H., Carter, A. S., Kadlec, M. B., & Dunn, W. (2007). Extreme sensory modulation behaviours in toddlers with autism spectrum disorders. *American Journal of Occupational Therapy*, 61(5), 584–592. <https://doi.org/10.5014/ajot.61.5.584>.
- Ben-Sasson, A., Hen, L., Fluss, R., Cermak, SA., Engel-Yeger, B., Gal, E.(2009). A meta-analysis of sensory modulation symptoms in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 39 (1), 1-11. <https://doi.org/10.1007/s10803-008-0593-3>.
- Bettison, S. (1994). Abnormal responses to sound and the long-term effects of a new treatment program. Sydney, Australia: Autism Research Institute.

- Caplan, B., Feldman, M., Eisenhower, A. & Blacher, J. (2016). Student–Teacher Relationships for Young Children with Autism Spectrum Disorder: Risk and Protective Factors. *Journal of Autism and Developmental Disorders*, 46 (12), 3653–3666. <https://doi.org/10.1007/s10803-016-2915-1>.
- Cesaroni, L., & Garber, M. (1991). Exploring the experience of autism through first hand accounts. *Journal of Autism and Developmental Disorders*, 21(3), 303–313. <https://doi.org/10.1007/BF02207327>.
- Chamak, B., Bonniau, B., Jaunay, E. & Cohen, D. (2008). What can we learn about autism from autistic persons? *Psychotherapy and Psychosomatics*, 77 (5), 271–279. <https://doi.org/10.1159/000140086>.
- Dugas, C., Simard, M.-N., Fombonne, E., & Couture, M. (2018): Comparison of two tools to assess sensory features in children with autism spectrum disorder. *American Journal of Occupational Therapy*, 72 (1), 1-9, <https://doi.org/10.5014/ajot.2018.024604>.
- Frieden, T. R., Jaffe, H. W., Cono, J., Richards, C. L., & Iademarco, M. F.; Developmental Disabilities Monitoring Network Surveillance Year 2010 Principal Investigators; Centres for Disease Control and Prevention. (2014). Prevalence of autism spectrum disorder among children aged 8 years—Autism and developmental disabilities monitoring network, 11 sites, United States, 2010. *MMWR Surveillance Summaries*, 63, 1–21.
- Gillberg, C., & Coleman, M. (1996). Autism and medical disorders: A review of literature. *Developmental Medicine and Child Neurology*, 38 (3), 191–202. <https://doi.org/10.1111/j.1469-8749.1996.tb15081.x>.
- Gillberg, C., & Coleman, M. (2000): *The biology of autistic syndromes*. London: Cambridge Press.
- Glod, M., Riby, D. M., Honey, E., & Rodgers, J. (2015). Psychological correlates of sensory processing patterns in individuals with autism spectrum disorder: A systematic review. *Review Journal of Autism and Developmental Disorders*, 2 (2), 199–221. <https://doi.org/10.1007/s40489-015-0047-8>.
- Greenspan, S. I., & Weider, S. (1997). Developmental patterns and outcomes in infants and children with disorders relating and communicating: A chart review of 200 cases of children with autistic spectrum diagnoses. *Journal of Developmental and Learning Disorders*, 1(1), 87–142.
- Green, D., Chandler, S., Charman, T., Simonoff, E. & Baird, G. (2016). Brief report: DSM-5 sensory behaviours in children with and without an autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 46 (11), 3597–3606. <https://doi.org/10.1007/s10803-016-2881-7>.
- Hazen, E. P., Stornelli, J. L., O'Rourke, J. A., Koesterer, K., & McDougale, C. J. (2014): Sensory symptoms in autism spectrum disorders. *Harvard Review of Psychiatry*, 22 (2), 112–124. <https://doi.org/10.1097/01.HRP.0000445143.08773.58>.
- Jones, CR., Happé, F., Baird, G., Simonoff, E., Marsden, AJ., Tregay, J., Phillips, RJ., Goswami, U., Thomson, JM. & Charman, T. (2009). Auditory discrimination and auditory sensory behaviours in autism spectrum disorders. *Neuropsychologia*, 47 (13), 2850–2858. <https://doi.org/10.1016/j.neuropsychologia.2009.06.015>
- Kientz, M. A., & Dunn, W. (1997): A comparison of the performance of children with and without autism on the Sensory Profile. *American Journal of Occupational Therapy*, 51 (7), 530–537. <https://doi.org/10.5014/ajot.55.4.416>.
- Kulage, K., Smaldone, A. & Cohn, E. (2014). How Will DSM-5 Affect Autism Diagnosis? A Systematic Literature Review and Meta-analysis. *Journal of Autism and Developmental Disorders*, 44 (8), 1918–1932. <https://doi.org/10.1007/s10803-014-2065-2>.
- Lane, AE., Molloy, CA. & Bishop, SL. (2014): Classification of children with autism spectrum disorder by sensory subtype: a case for sensory-based phenotypes. *Autism Research*, 7 (3), 322–333. <https://doi.org/10.1002/aur.1368>.
- Muratori, F., Tonacci, A., Billeci, L., Catalucci, T., Iglizzi, R., Calderoni, S. & Narzisi, A. (2017). Olfactory Processing in Male Children with Autism:

- Atypical Odor Threshold and Identification. *Journal of Autism and Developmental Disorders*, 47 (10), 3252–3252. <https://doi.org/10.1007/s10803-017-3291-1>.
- Marshall RD, Spitzer R, Liebowitz MR. (1999). Review and Critique of the New DSM-IV Diagnosis of Acute Stress Disorder. *American Journal of Psychiatry* 156, 1677–1685. <https://doi.org/10.1176/ajp.156.11.1677>.
- Rellini, E., Tortolani, D., Trillo, S., Carbone, S. & Montecchi, F. (2004). Childhood Autism Rating Scale (CARS) and Autism Behaviour Checklist (ABC) Correspondence and Conflicts with DSM-IV Criteria in Diagnosis of Autism. *Journal of Autism and Developmental Disorders*, 34 (6), 703-708. <https://doi.org/10.1007/s10803-004-5290-2>.
- Repetto, L., Jasmin, E., Fombonne, E., Gisel, E. & Couture, M. (2017): A Longitudinal Study of Sensory Features in Children with Autism Spectrum Disorder. *Autism Research and Treatment*, Volume 2017, 1-8. <https://doi.org/10.1155/2017/1934701>.
- Rounsaville BJ, Alarcón RD, Andrews G, Jackson JS, Kendell RE, Kendler K. (2002). Basic nomenclature issues for DSM-V. In: Kupfer D, First MB, Regier DE, editors. *A Research Agenda for DSM-V*. Washington, DC: American Psychiatric Association; 2002.
- Sabatos-DeVito, M., Schipul, SE., Bulluck, JC., Belger, A. & Baranek GT. (2016). Eye Tracking Reveals Impaired Attention Disengagement Associated with Sensory Response Patterns in Children with Autism. *Journal of Autism and Developmental Disorders*, 46 (4), 1319-1333. <https://doi.org/10.1007/s10803-015-2681-5>.
- Sakarneh, M. (2014a). Quality Teaching: The Perspectives of the Jordanian Inclusive Primary School Stakeholders and the Ministry of Education. *International Journal of Psychological Studies*, Vol. 6, No. 4, 26-40. <https://doi.org/10.5539/ijps.v6n4p26>
- Sakarneh, M. (2014b). Quality Teaching Practices in the Jordanian Inclusive Primary Classrooms. *Asian Social Science*, Vol. 10, No. 19, 113-123. <https://doi.org/10.5539/ass.v10n19p113>.
- Sakarneh, M. (2015). Articulation of Quality Teaching: A Comparative Study. *Journal of Education and Training Studies*, Vol. 3, N. 1, 7-20. <https://doi.org/10.11114/jets.v3i1.579>.
- Sakarneh, M., Paterson, D. & Minichiello, V. (2016). The Applicability of the NSW Quality Teaching Model to the Jordanian Primary School Context. *Dirasat: Educational Sciences*, Volume 43, Supplement. 4, 1773-1789.
- Samson, A. C., Phillips, J. M., Parker, K. J., Shah, S., Gross, J. J., & Hardan, A. Y. (2014). Emotion dysregulation and the core features of autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 44 (7), 1766–1772. <https://doi.org/10.1007/s10803-013-2022-5>
- Schaaf, R. C., & Lane, A. E. (2015). Toward a best-practice protocol for assessment of sensory features in ASD. *Journal of Autism and Developmental Disorders*, 45 (5), 1380–1395. <https://doi.org/10.1007/s10803-014-2299-z>.
- Osterling, J., & Dawson, G. (1994). Early recognition of children with autism: A study of first birthday home videotapes. *Journal of Autism and Developmental Disorders*, 24 (3), 247–257.
- Posar, A. & Visconti, P. (2018): Sensory abnormalities in children with autism spectrum disorder. *Journal de Pédiatrie*, 94 (4), 342-350. <https://doi.org/10.1016/j.jpmed.2017.08.008>.
- Tavassoli, T., Bellesheim, K., Siper, PM., Wang, AT., Halpern, D., Gorenstein, M., Grodberg, D., Kolevzon, A. & Buxbaum, J. (2016). Measuring sensory reactivity in autism spectrum disorder: application and simplification of a clinician administered sensory observation scale. *Journal of Autism and Developmental Disorders*, 46 (1), 287-293. <https://doi.org/10.1007/s10803-015-2578-3>.
- Tomchek, S. D., & Case-Smith, J. (2009): *Occupational therapy practice guidelines for children and adolescents with autism*. Bethesda, MD: AOTA Press.
- Herman M. van Praag. (2000). Nosologomania: A Disorder of Psychiatry. *The World Journal of Biological Psychiatry*, 1(3), 151-158.

- <https://doi.org/10.3109/15622970009150584>.
- Watson, L. R., Patten, E., Baranek, G. T., Poe, M., Boyd, B. A., Freuler, A., & Lorenzi, J. (2011). Differential associations between sensory response patterns, language, social and communication measures in children with autism or other developmental disabilities. *Journal of Speech, Language, and Hearing Research*, 54 (6), 1562–1576. [https://doi.org/10.1044/1092-4388\(2011/10-0029\)](https://doi.org/10.1044/1092-4388(2011/10-0029)).
- Yasuda, Y., Hashimoto, R., Nakae, A., Kang, H., Ohi, K., Yamamori, H., Fujimoto, M., Hagihira, S. & Takeda, M. (2016). Sensory cognitive abnormalities of pain in autism spectrum disorder: a case-control study. *Annals of General Psychiatry*, 15 (8), 1-8. <https://doi.org/10.1186/s12991-016-0095-1>.
- Zureiqat, Ibrahim & Imam, Muhammad. (2007). Psychological and educational evaluation of sample of autistic children (in Arabic). The 14th Annual Conference, Psychological Counselling Centre, Ain Shams University, Egypt.