



Research Article

ISSN : 2277-3657  
CODEN(USA) : IJPRPM

## ***Standardization of Winnie Duun sensory profiling questionnaire on children aged 3 to 10 years***

***<sup>1</sup>Valioallah Farzad, <sup>2</sup>Mahnaz Estaki, <sup>3\*</sup>Somaye Fahimi Tafreshi, <sup>4</sup>Morteza Abbasi***

*<sup>1</sup>Associate Professor, Department of Psychology, Faculty of Psychology and social sciences, Central Tehran Branch, Islamic Azad University, Tehran, Iran. Email: val.farzad@iauctb.ac.ir*

*<sup>2</sup>Assistant Professor, Department of Psychology, Faculty of Psychology and social sciences, Central Tehran Branch, Islamic Azad University, Tehran, Iran*

*<sup>3\*</sup>M.Sc. Student in Psychometrics, Department of Psychology, Faculty of Psychology and social sciences, Central Tehran Branch, Islamic Azad University, Tehran, Iran. (Corresponding Author)*

*<sup>4</sup>M.Sc in Change Management*

---

### **ABSTRACT**

*The present study was conducted to evaluate the psychometric properties of Dan Winnie sensory profiling test (1999) in a population consisting of children aged 3 to 10 in regions 1, 2, and 3 in Tehran in a sample of 800 people in 8 age groups, selected by cluster random sampling method. To achieve the research objectives, one main question and three sub-questions were developed. Data was analyzed at descriptive and inferential levels, especially confirmatory factor analysis. Results show that 1) nine-component questionnaire (83 questions) has a reliability of 0.95 so that none of the questions was negatively correlated. 2) Cronbach's alpha coefficient for the nine components was between 0.536 and 0.864. 3) In the confirmatory factor analysis, in the second model by eliminating question 25, all variables (questions) got a high factor loading 0.50. 4) In the final model of confirmatory factor analysis, 9 factors of Winnie Dunn questionnaire were confirmed only by eliminating 25 questions. 5) The difference between the average scores of girls and boys is 4.377 and significant ( $p < 0.05$ ). 6) Table of percentile was developed for each of the nine components.*

**Keywords:** *sensory profiling, standardization, Winnie Dunn*

---

### **INTRODUCTION**

The presence of a sensory integration disorder is normally recognized in young children. This is while sensory integration grows during normal activities of childhood and helps create dimensions such as the ability of motion planning and adaptation to entry sensation, and the ability of sensory integration does not grow efficiently in other children. When this process is disturbed, all sorts of problems in learning, development, or behavior become apparent (Galvin, 2009).

People who have sensory integration disorder (SID) may not be able to respond to specific sensory information by planning and organizing what needs to be done in an automated and appropriate manner. This may create a primitive critical technique called "fight-or-flight" or withdrawal reaction that stems from primitive brain. This reaction usually appears for severe, specific, and inappropriate situations. Neurological disorders that lead to dysfunction of sensory integration / sensory processing disorder occur in three different ways: the brain does not get the messages because of disconnection of neuron cells, sensory messages are received continuously, or sensory messages are received

continuously, but they are not connected with other sensory messages in a correct form. When the brain processes the sensory messages poorly, it leads to linguistic or motor output or an ineffective movement (Galvin, 2009). Therefore, with regard to international sensory integration, a nonprofit organization, in connection with the impact of sensory integration problems on people's lives, has stated the following titles as SID / sensory processing disorder (SPD): extreme sensitivity to touch, movement, sights and sounds, low reactivity to touch, movement, sights or sounds, specific difficulties in learning / delay in achieving academic achievement, difficulty in transition from one situation to another, tendency to deviation / focus control and limited attention, the level of activity that is unexpectedly high or unexpectedly low, social and or sensational problems, difficulty in learning new movements, delays in motor skills, language or speech, physical slowing or evident carelessness, defects in self-control, inability to maintain control and calmness, and weak body/mind awareness (Silver, 2008). While research shows that sensory integration problems are found in over 70% of children identified with learning disabilities by schools, sensory integration problems are not limited to children with learning disabilities. In their study, Esmoluaska, Mac Cabello and Woody (2009) discovered and validated a three-factor model of sensory processing style. After conducting an exploratory factor analysis, these researchers concluded that sensory processing sensitivity consists of three components: ease of excitation (easily excited), low sensory threshold, and aesthetic sensitivity.

SID/ Sensory Processing Disorder are transmitted in all age groups, as it is transmitted in social and economic groups and intellectual levels. As in this research, Cronbach's alpha for the whole nine-component questionnaire (83 questions) was 0.95, while none of these questions had a negative correlation. The factors leading to SID include premature birth, autism and other developmental disorders, while it can also result in learning disabilities, delinquency and substance abuse because of learning disabilities, brain injuries, and stress-related disorders (Baker, 2008).

In order to determine the presence of SID/SPD, there may be a need for evaluation by an occupational therapist. The process can include both standardized tests and observation and interviews including: type of response to sensory stimuli, posture, balance, coordination, and eye movements. The results of these tests and evaluations are compared with information collected by other people, parents, educators or other professionals and become more complete to be able to choose the best treatment. One of the famous and widely used questionnaires in sensory evaluation is Winnie Dunn sensory profile test used to assess the effects of sensory information on the performance of children. So far no studies have been undertaken in the country to normalize and study psychometric properties of this questionnaire. The importance of this research is in that by assessing the sensory profile, professionals, therapists, and trainers can identify how children of ages 3 to 10 process sensory information in different conditions. In the use of WDSQP, Kern et al. (2006) found that individuals with autism have abnormalities in processing auditory, visual, touch, and taste stimuli that are significantly different from the control group. Moreover, Shimitz et al. (2001) used this test and determined that Children with ADHD have significant impairment compared with the control group in sensory processing and modulation, as well as in behavioral and emotional responses in 11 subject of 14 parts and 6 of 9 components. The difference was also observed in all sensory response patterns between the two groups of children. Sensory scores showed relatively negative correlation with CBCL and EACI scores in the ADHD group. The results showed that children with ADHD might show sensory processing disorders to behavioral responses and inappropriate learning.

The results of sensory profile along with other assessment information give the therapists a better insight for diagnosis and intervention planning, and this indispensable tool offers a family-centered approach for sensory processing in research, and offers valuable information to study the behavior of children, interpret and to offer interventions plans. Moreover, since the test is answered by the child's guardian, it leads to more attention of the parents to their children senses that helps improve the quality of their lives. Accordingly, the present study wants to investigate the psychometric properties of Winnie Duun sensory profiling test, the research that has been done in Iran. Thus, we hope that through this study in the Iranian society with the Iranian norm, we can assess and evaluate sensory information effects on the performance of children. Thus, the aim of this study is to determine whether Winnie Duun sensory profiling test questionnaire has good psychometric properties in Iranian society.

## METHODOLOGY

The study is of correlational studies. The study population includes first and second grade high school students in Tehran, who have enrolled in special schools in the academic year 2015-2016. The sample consists of 800 subjects from the population that have randomly been selected. The measuring tool of the study is Winnie Duun sensory profiling questionnaire (WDSPQ) (1999) containing 9 components and 83 questions whose answers are in Likert scale from always (1) to never (5). The data in this study is obtained using the statistical software SPSS.22 and Amos.22 at the levels of frequency indices (frequency, percentage, percent density), measures of central tendency (mean, median, mode), dispersion indices (standard deviation, range), and at the inferential statistics first order confirmatory factor analysis, second order confirmatory factor analysis, and test correlation coefficient are used. For reliability, methods of internal consistency with Cronbach's alpha coefficient and split-half method are used.

## RESULT

1) Is WDSPQ reliable for children aged 3 to 10 years?

For reliability, the method of internal consistency was used.

**Table 1:** Cronbach's alpha coefficients of nine-component questionnaire with 83 questions

Row	ID	Component	The questions order in the original questionnaire	The number of question	Alpha value
1	A	Auditory processing	1 to 8	8	0.66
2	B	Visual processing	9 to 17	9	0.713
3	C	Balance processing	18 to 28	11	0.732
4	D	Tactile processing	29 to 46	18	0.817
5	E	Multi-sensory processing	47 to 53	7	0.704
6	F	Oral/Sensory Processing	54 to 65	12	0.845
7	G	Sensory processing in relation to endure muscle Eton	66 to 74	9	0.864
8	M	The behavioral results of sensory processing	117 to 122	6	0.746
9	N	Items determining the response threshold	123 to 125	3	0.536
		Total	1 to 74 And 117 to 125	83	0.95

Cronbach's alpha for the whole nine-component questionnaire (83 questions) was 0.95. In this validation, none of these questions had a negative correlation, and the correlations were from 0.14 to 0.58.

Analyzing skewness and curtosis values demonstrated that the presumption of normality of data is established.

2. Are the collected results capable of being analyzed by factor-reliability analysis?

To determine data fit, three tests are acceptable. The three acceptable tests are a strong figure, and confirmatory factor analysis can be performed. Jaccard and Wan believe that in general, if at least three coefficients have amounts in the acceptable range, we can claim that model fitness is approved (Pahlavan-Sharif et al., 1394). Therefore, model fitness is also accepted in the present analysis.

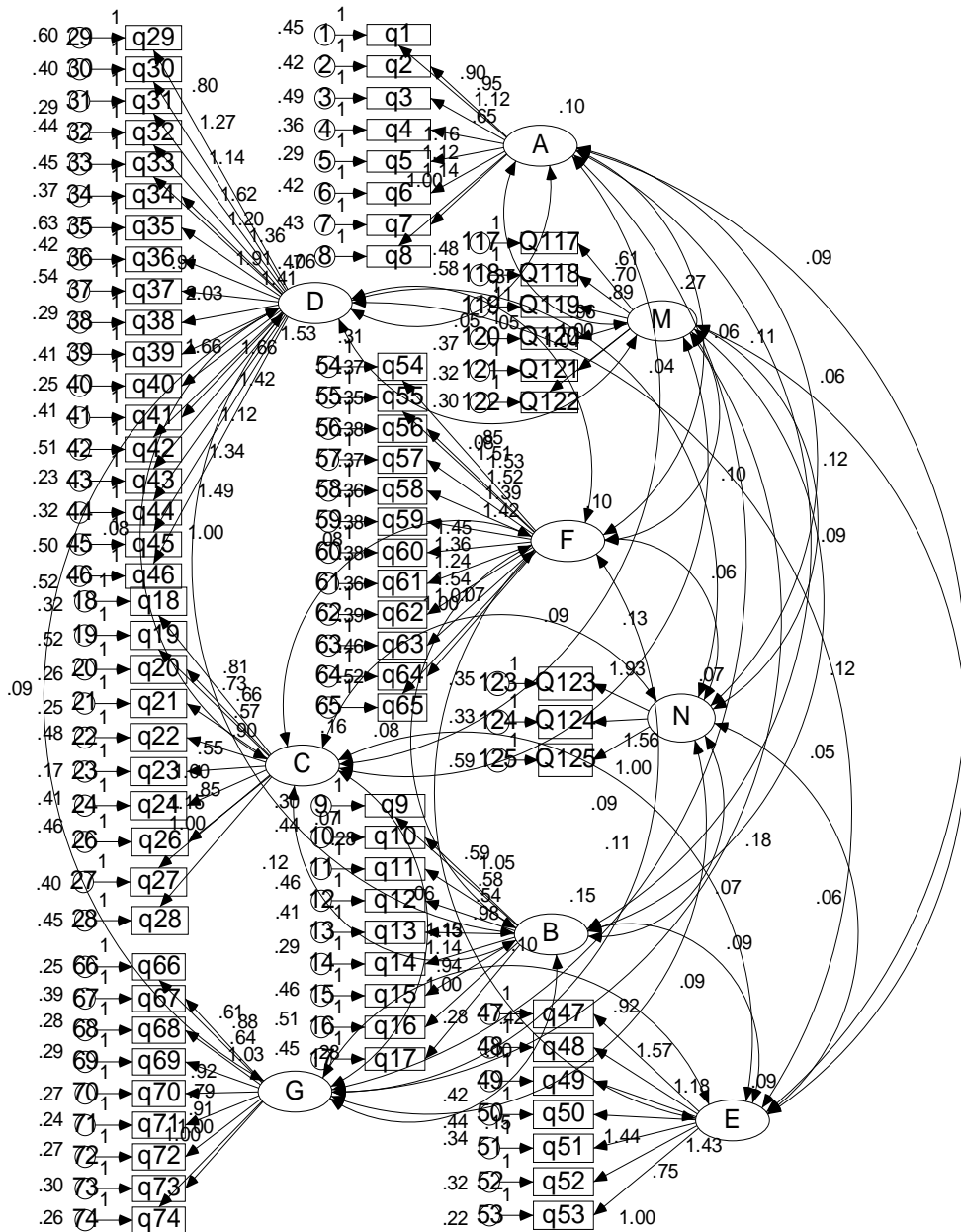


Figure 1: Extraction of the second model after the removal of question 25

According to Figure 1, factor loading of some variables has increased. What is important is that the questions with factor loading less than 0.50 are not seen. Therefore, all variables (questions) have factor loading higher than 0.05 loading, so nine components of WDSPQ are confirmed only by eliminating question 25.

Table 2: Tests of data fitting in three groups of absolute fit, adaptive fit, and thrifty fit

Row	Test		Values calculated	Result
1	Chi-square (CMIN)	Chi	16040.663	unacceptable
		sig	0.000	
2	CMIN/DF		4.884	acceptable
3	GFI		0.668	unacceptable
4	AGFI		0.674	unacceptable
11	PCFI		0.514	acceptable
12	RMSEA		0.07	acceptable

In this study model fitness is approved.

In the basic model, weak questions were extracted and eliminated. By eliminating question 25 (with a factor loading 0.26), model extraction was redone, and the following model was obtained by improving the status of coefficients, factor loading, and fit statistics.

3. Is there a difference between boys and girls in WDSPQ?

In comparing mean scores of girls and boys on the assumption of equal variances test, Table 5 shows p value of Levene's test (0.745) where the distribution of scores of girls and boys has the same variance. Moreover, difference between mean scores of girls and boys is 4.377, and due to t value (-2.322) and p value (0.02), we can argue that calculated t is statistically significant only at the level of 0.05. Therefore, it does not seem necessary to calculate norms separately.

**Table 3:** Measure of central tendency and dispersion of scores of girls and boys in the samples

Levene's test		t test			
F value	Significance level	t value	Degrees of freedom	Significance level	The mean difference
0.106	0.745	-2.322	798	0.020	-4.3775

**DISCUSSION AND CONCLUSION**

We conclude that, according to what was stated in the answer to research questions it seems that the present study is considered an important step in advancing applied psychometrics in the country. WDSPQ has a lot of use in scientific research, and with care, it can be used for the diagnosis of sensory processing. In addition, considering the importance of sensory processing, the existence of such a questionnaire in the country is mandatory. In addition, this movement, as a starting point of subsequent measures and research, has had useful results and findings. However, we must accept that there have been limitations and shortcomings in this regard that are expressed. The findings are consistent with some previous studies. However, similar research has not been done in Iran, but outside the country, a few studies have been carried out about its reliability, validity, and psychometric properties. Among these studies, studies by Hie Don (2010) and Esmoluaska, Mac Cabello and Woody (2009) can be pointed out.

Four-factor sensory processing model of Don (2010), especially in the field of occupational therapy has gained growing popularity. This model examined sensory processing in the form of four components: low registration, sensory sensitivity, sensation avoiding, and sensory seeking. Don assumed that sensory processing is dependent on two main factors: 1. sensory threshold that can be low or high (how much stimulation is needed for the person to respond to stimuli) and 2) the individual response strategy that can be active or passive. Having a high sensory threshold and a passive response mode is classified as low registration. While having a high sensory threshold and active response mode is classified as sensation seeking. Having a low threshold and a passive way of response is classified as sensory sensitivity, while having a low sensory threshold and an active response is classified as sensory avoidance.

Other studies have somehow dealt with convergent validity. These studies include the studies by Dehgan et al. (2015), Hutch Haser and Engil-Eiger (2006), Cheung and Su (2006), Kern et al. (2006), Shimitz et al. (2001) noted. In their study, Dehgan et al. (2015) found that in the two groups of children with attention deficit hyperactivity disorder and normal children, the differences in terms of sensation seeking, emotional response, low muscle tone and endurance, inattention and distractibility, impaired sensory register, fine movements / understanding have been meaningful.

However, in terms of oral sense sensitivity, sensory sensitivity, and lack of movement, the differences between the two groups are not significant. The correlation between the variables of the questionnaire of Child Behavior Checklist and sensory status has been significant in sense of ambition and excitement, muscle tone and endurance, inattention and distractibility, fine movements and understanding, and weakness of sensory register with some variables of Child Behavior Checklist. It should be noted that these findings could be used to strengthen the discriminant validity of WDSPQ. In this regard, the study by Hutch Haser and Engil-Eiger (2006) showed that children with autism spectrum disorders have abnormal sensory processing abilities with high performance. They also had low participation in leisure-time. Abnormal sensory processing patterns have a relationship with low participation, particularly in social, physical, and formal activities. In a study, Chong and Sue (2006) found that the sensory processing in children with and without disabilities is different, but determining the difference in sensory processing between children with autism and attention deficit / hyperactivity disorder is difficult.

## REFERENCES

- American Psychology Association (APA). (2000). "Diagnostic and Statistical Manual-Text Revision." Chicago, I. L. Association, p: 68.
- Aron, E.N., & Aron, A. (1997). " Sensory-processing Sensitivity and its Relation to Introversion and Emotionality," *Journal of Personality and Social Psychology*, 73(2), 345–368.
- Baker, J. (2000). " The social skills picture book: teaching play, emotion and communication to children with autism." New York: Future horizons.
- Bhjne, U.,Chitnis, A(2002)."Vestibular dysfunction in children with pervasive developmental disorder.The Indian Journal of Occupational Therapy," XXXIV, 1.
- Bosse, M. L., Tainturier, M. J., & Valdois, S. (2007). "Developmental dyslexia: The visual attention span deficit hypothesis". *Cognition*, 104(2), 198–230.
- Breslau, N., Chilcoat, H. D., Johnson, E. O., Andreski, P., & Lucia, V. C. (2000). " Neurologic soft signs and low birthweight: Their association and neuropsychiatric implications." *Biological Psychiatry*, 47, 71–79.
- Bröring T, Rommelse N, Sergeant J, Scherder E.(2008)." Sex differences in tactile defensiveness in children with ADHD and their siblings". *Dev Med Child Neural*2008; 50:1
- Dalen, K., Bruaroy, S., Wentzel-Larsen, T., Nygaard, M., & Laegreid, L. M. (2006). " Nonverbal learning disabilities in children with infantile hydrocephalus, aged 4–7 years: A population-based, controlled study". *Neuropediatrics*, 37, 1–5.

- Dunn, W. (2001). "The Sensations of Everyday Life: Empirical, Theoretical, and Pragmatic considerations", *The Journal of Occupational Therapy*, 55, 608–620.
- Fiona E. J. , Steven D. Stagg ,( 2015). " How Sensory Experiences Affect Adolescents with an Autistic Spectrum Condition within the Classroom." *Journal of Autism and Developmental Disorders*. May 2016, Volume 46, Issue 5, pp. 1656-1668.
- Hatami R, ( 2012) . "Evaluation of sensory over-responsivity in children with attention deficit Hyperactivity disorder aged 6-11 years referred to occupational therapy clinics in Tehran based On sensory over-responsivity inventory, (Dissertation for the degree of Master of Science)," University of social welfare and rehabilitation of science, July 2012[Persian]
- Jameson, P. L. (2006). "Diabetes, cognitive function, and school performance." *School Nurse News*, 23, 34–36.
- Kelin, A. (2006)." Autism and Asperger syndrome: an overview." *Rev Bars Psiquiter*, 28(1): 3-11
- Kirby, J. R., Parrila, R. K., & Pfeiffer, S. L. (2003)." Naming speed and phonological awareness as predictors of reading development." *Journal of Educational Psychology*, 95, 453–464.
- McIntosh DN, Miller LJ, Shyu V,( 1999). "Hagerman RJ. Sensory modulation disruption, lectro dermal responses and functional behaviors". *Developmental Medicine Child eurology* 1999; 41:608–15.
- Miller L J, Reisman J E, McIntosh D N, Simon J. ( 2001) . "An ecological model of sensory modulation: Performance of children with fragile X syndrome, autistic disorder, attention-deficit/hyperactivity disorder, and sensory modulation dysfunction. In S. Smith-Roley", E. I. Blanche, & R. C. Schaaf. *Understanding the nature of sensory integration with diverse populations*; 2001: 57-88.
- Miller, L. J., Anzalone, M. E., Lane, S. L., Cermak, S. A., & Osten, E. T. (2007)." Concept evolution in sensory integration: A proposed nosology for diagnosis." *American Journal of Occupational Therapy*, 61, 135–140.
- Neu, M. ( 1997)." Irritable infants: Their childhood characteristics." *Dissertation Abstracts International*1997; 58(4B):1805.
- Roger S, (2003). "Hepburn S, Wehner E, Parent reports of sensory symptoms in toddlers with Autism and those with other developmental disorder," *Autism and Developmental Disorders* 2003; 33[5]: 631-642.
- Schaaf R. C, Miller L. J,(2005). "Occupational therapy using a sensory integrative approach for children with developmental disabilities," *Mental Retardation and Developmental Disabilities Research Reviews* (2005); 11[1]: 143-148.
- Schiffer R.B, Rao S.M, Fogel B.S,(2003)." *Neuropsychiatry*, Lippincott Williams & Wilkins 530 Walnut Street", Philadelphia, PA19106 USA, 2003.
- Sevlever, M. Gillis, J. M. (2010). "An examination of the state of imitation research in children with autism: Issues of definition and methodology," *Research in Developmental Disability* 31: 976-984.
- Shaywitz, B. A., Shaywitz, S. E., Pugh, K. R., Mencle, W. E., Fulbright, R. K. & Skudlarski, P. (2002)." Disruption of posterior brain systems for reading in hildren with developmental dyslexia." *Biological Psychiatry*, 52, 101–110.
- Shillingsford, A. J., & Wernovsky, G. (2004)." Academic performance and behavioral difficulties after neonatal and infant heart surgery." *Pediatric Clinics of North America*, 51, 1625–1639.
- Shimizu, VT, Bueno, OF, Miranda, MC., (2014). "Sensory processing abilities of children with ADHD." *Braz J Phys Ther*. 2014 Jul-Aug; 18(4):343-52. Epub 2014 Jul 25.

- Silver, C. H., Ruff, R. M., Iverson, G. L., Barth, J. T., Broshek, D. K., Bush, S. S., Koffler, S. P. & Reynolds, C. R. (2008). "Learning disabilities: The need for neuropsychological evaluation." *Archives of Clinical Neuropsychology*, 23, 217–219.
- Tsatsanis, K. D., Fuerst, D. R., & Rourke, B. P. (1997). "Psychosocial dimensions of learning disabilities: External validation and relationship with age and academic functioning." *Journal of Learning Disabilities*, 30, 490–502.
- Parham, D. L., & Mailloux, Z. (2001). "Sensory integration. In J. Case-Smith, "A. S. Allen, & P. N. Pratt (Eds.), *Occupational therapy for children* (3rd ed., pp. 307–355). St. Louis Mosby.
- Wolf, M., Bowers, P. G., & Biddle, K. (2000). "Naming-speed processes, timing, and reading: A conceptual view." *Journal of Learning Disabilities*, 33, 387–407.
- Eden, G. F., VanMeter, J.W., Rumsey, J. M., Maisog, J. M., Woods, R. P., & Zeffiro, T. A. (1996)." Abnormal processing of visual motion in dyslexia revealed by functional brain imaging." *Nature*, 382, 66–69.
- De Luca, M., Burani, C., Paizi, D., Spinelli, D., & Zoccolotti, P. (2010)." Letter and letterstring processing in developmental dyslexia." *Cortex*, 46, 1272–1283.
- Hari, R., & Renvall, H. (2001)." Impaired processing of rapid stimulus sequences in dyslexia." *Trends in Cognitive Science*, 5, 525–532.
- Wright, C. M., Conlon, E. G., & Dyck, M. J. (2012)." Visual search deficits are independent of magnocellular deficits in dyslexia." *Annul of Dyslexia*, 62, 53–69.
- Feng, H.,Lo, Y.,Tsai, Sh.,Cartledge, G.(2008." ffects of theory- of - mind and social skill training on the social competence f a sixth- grade student with autism ." *Journal Behavior Interventions*, 10(4):228- 242.
- Tews, L. (2007)."Early intervention for children with Autism: Methodologies critique." *Developmental Disabilities Bulletin*, 35(1), 148- 168.
- Baker, AE.,Lane, A.,Angley, MT.,Young,RL.(200S)." Tbe Relationship between sensory processing patterns and behavioural responsiveness in autistic disorder: A pilot studyJ *Autism Dev disord* ".38, 867- 875.
- Dunn, W.,Saiter, J., Rinner, 1.(2002). "Asperger syndrome and sensory processing: A conceptual model and guidance for intervention planning." *Focus on Autism and other Developmental Disabilities*, 17, 3.
- Dunn, W.(2007). "Supporting children to participate successfully in everyday life by using sensory processing knowledge.*Infants& Young children*," 20, 2, 84-101.
- Galvin, J., Froude, EH. Imms, C. (2009). "Sensory processing Abilities of children who Have Sustained Traumatic Brain Injuries. *American Journal of occupational therapy* 63, 701-704.
- Dunn, W.,Daniels, D.(2002)." Initial development of the Infant! Toddler sensory profile *Journal of Early Intervention*", 25(1), 27- 41.
- Leckarn, SR., Nieto, C. Libby, So., wing, L., Gould, J. (2007). "Describing the sensory Abnormalities of children and Adults with Autism." *Journal of Autism Dev. Disorder* 37,894-910.
- Baker, AE.,Lane, A.,Angley, MT.,Young,RL.(2008). "Tbe Relationship between sensory processing patterns and behavioural responsiveness in autistic disorder: A pilot studyJ *Autism Dev disord* ".38, 867- 875.
- Gal, E.,Dyck., M., Passmore, A(2002)".Sensory differences and stereotyped movements in children with autism. *Behavior Change*", 19(4), 207- 219.



- Silver, C. H., Ruff, R. M., Iverson, G. L., Barth, J. T., Broshek, D. K., Bush, S. S., Koffler, S. P. & Reynolds, C. R. (2008). " Learning disabilities: The need for neuropsychological evaluation. Archives of Clinical Neuropsychology", 23, 217–219.
- Tsatsanis, K. D., Fuerst, D. R., & Rourke, B. P. (1997). " Psychosocial dimensions of learning disabilities: External validation and relationship with age and academic functioning." Journal of Learning Disabilities, 30, 490–502.
- Waiting, RL. Deitz, J., white, 0 (2001). "Comparison of sensory profile scores of young children with and without Autism spectrum Disorders." American Journal of occupational therapy, 55 (4), 416- 423.
- Dunn W, ( 1997). " The impact of sensory processing abilities on the daily lives of young children and their families: A conceptual model, Infants and Young Children ."1997; 9[3]: 23-35.
- Dunn W,( 2009) . " sensory profile school companion, Pearson, NCS Pearson, Inc." Printed in the United States of America, 2006. 21. Bontimo T, sensory processing patterns in high-ability adults with autism spectrum disorders in the workplace, (Dissertation for the degree of Doctor of Education), Queen’s University, August 2009.
- Dunn W, (2007). "Supporting children to participation successfully in everyday life by Using sensory processing knowledge, Infants and Yong children." 2007; 20[1]: 84-101.
- Wang, W. C. (2007). "Central nervous system complications of sickle cell disease in children: An overview." Child Neuropsychology, 13, 103–119.