Adaptation and Validation of the Home and School Forms of the Sensory Processing Measure-Preschool (SPM-P) for Use in Ethiopia

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Abstract: Despite the encouraging trend in public awareness of the need for psychological support, there are indications that psychologists in Ethiopia face a wide range of challenges to keep up with the growing demand. One gap concerns the availability of measures. As part of the needed effort to bridge this gap, the present study attempts to adapt and validate an existing measure, the Sensory Processing Measure Preschool (SPMP), for use in the Ethiopian context. The study selected 676 participants who were typically developing children and 29 children with special needs aged between two and five years and selected from kindergartens in Addis Ababa. The SPM-P is a rating scale with home and school forms, each containing 75 items which are completed by the parent/caregiver and teacher/day-care provider respectively. Stratified random sampling and availability sampling techniques were employed to select the typically developing group and children with special needs, respectively. The results indicated good reliability coefficients for both forms (Home form, .93 and School form, .92) of the SPMP Amharic Version (SPMP-AV) and for the subscales (ranging from .60 to .90). Besides, SPMP-AV significantly discriminated between typically-developing children and children with special needs ($p < .001$), indicating the scale's discriminant validity. The scale's convergent validity was further established. Overall, SPMP-AV demonstrated good psychometric characteristics; with careful use, it can play a significant role in the development of evidence-based practices to address sensory processing disorders in Ethiopia.

Key words: Sensory Processing Measure Preschool Amharic Version, sensory integration disorder, sensory integration, validity, reliability

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Background

It is common nowadays to observe an increasing number of parents in Addis Ababa looking for professional mental health support both for themselves and for their children. A good example is the number of new cases received every week in Abrhot Psychological Services where the first author works. More specifically, Abrhot Psychological Services, a recently established mental health center in Addis Ababa, receives 20 to 25 new cases every week. Encouraged by this increasing trend, a number of psychologists have started opening centers where psychological support could be provided to both children and adults. Despite this encouraging trend in the growing awareness of the need for psychological support among the public, there are indications that psychologists in private practice (in Ethiopia) have been constrained in meeting this growing demand. In view of these challenges, it is difficult to ascertain that Ethiopian mental health professionals are fully ready and able enough to provide the professional support the public needs. The present study attempted to address a major problem in this regard - the limited availability of measures for use in Ethiopia.

Although there are a number of measures developed (in English) in the Western context that graduate students in Ethiopia use when writing their theses, the use of the measures to obtain data for the purpose of diagnosis and treatment requires not only translating them into local languages but also ensuring that their items are relevant to and consistent with the local cultures. This, in turn, requires validating the tools for local use in general and scrutinizing each and every item of the original measure for relevance and consistency with the target culture in particular.

One characteristic of the growing need for professional mental health support in Addis Ababa concerns sensory processing difficulties (SPD) or related problems among young children. In recent years, an increasing number of parents have come forward looking for psychological support for children diagnosed with SPD or related problems. The cause of this increase is unknown but one may assume that improved awareness of the population is a significant contributing factor. Most of the time, children and their families find themselves compelled to sign up on the waiting list and to wait for a very long time until they can access professional assessment and treatment from the few available specialized centers.

Given the effect of SPD on the learning capacity and overall development of children, appropriate treatment is essential. However, thorough professional screening as well as diagnosis supported by standardized tests such as the SPM-P is needed to ensure the efficiency and adequacy of treatment. While recognizing the importance of standardized tests for screening and diagnosis of SPD, it is crucial to acknowledge the potential influence of cultural differences in the use of these types of tests. It is therefore important to adapt instruments/measures developed elsewhere and validate them for local use. In Ethiopia, diagnosis of psychological, neurological and psychiatric disorders does not have a long history. Hence, instruments developed in the West (notably DSM IV) have mostly been used. Adapting and validating these instruments into the Ethiopian context is not a common practice. Although there is evidence of adaptation and validation of other Western-based psychological diagnostic instruments into the Ethiopian context, the researchers could not find any existing validation work pertaining to the SPM-P.

Finally, several authors have developed a series of tests designed to assess and diagnose SPD such as the Sensory and Integration Praxis Tests (SIPT), the Sensory Profile, short sensory profile, sensory profile for

children. SPM-P is one of the most commonly used (Jorquera-Cabrera, Romero-Ayuso, Rodriguez-Gil and Triviño-Juárez, 2017) to assess and diagnose sensory processing disorder. It is found to be a highly reliable and valid measure. This provided an additional reason for the researchers to adapt and validate the SPM-P for use in the Ethiopian context.

What is Sensory Processing Disorder?

Sensory Processing Disorder (SPD), also known as Sensory Integration Dysfunction (SID), is a neurological disorder, which was first conceptualized by Jean Ayres in the 1950s. Among others, this neurological disorder causes difficulties in processing information received through the five classic senses (vision, audition, tactile, olfaction, and gustation), the sense of movement (vestibular system), and/or the positional sense (proprioception) (Biel and Peske, 2005).

According to Ayres (1979), a child's learning and overall development process can be affected by SPD/SID. SPD/SID occurs when sensory integration is inefficiently processed at brainstem level, affecting the subject's overall higher center function and subsequent motor output, which are crucial parameters affecting the learning process. Wilson, Edwards, Nicklin, Bennett, and Mcdunn Derment (1998) also demonstrated that dysfunction in one area of the brain could affect performance in other areas.

SPD is not recognized as an independent pathology in the DSM-IV and the DSM-V. Nevertheless, it is recognized by both the Diagnostic Manual for Infancy and Early Childhood (DMIC) of the Interdisciplinary Council on Developmental and Learning Disorders (ICDL) and the Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, Revised (DC: 0-3R, Zero to Three, 2005). In addition,

numerous empirical studies have demonstrated SPD's existence in children – with or without different developmental disorders – across different cultures.

The Prevalence of Sensory Processing Disorders

The prevalence of SPD/SID in Ethiopia is unknown due to lack of empirical data. However, the issue of determining the prevalence of SPD/SID is not a unique problem to Ethiopia and other developing countries. This general lack of data may explain the fairly recent recognition of Sensory Processing Disorder as an official diagnosis in 2005 in the DC: 0-3R (Zero to Three, 2005).

Some studies have reported prevalence estimates. For example, Ahn, Miller, Milberger and McIntosh (2004) found signs of SID in 5 to 15 percent of typically developing preschool children in the USA. Yet, many individuals with sensory processing deficits may not be accurately diagnosed since SPD is also associated with other developmental disorders such as Autism Spectrum Disorder (ASD), learning disabilities, etc. (Polatajko and Cantin, 2010). In fact, researchers estimate that 80 to 90 percent of children who have an ASD also demonstrate behaviors identified as "atypical sensory responsivity" (Rogers and Ozonoff, 2005). According to Lane, Reynolds and Dumenci (2012), the percentage of children with ASD exhibiting sensory processing deficits is increasing.

Since data on the prevalence of SPD in Ethiopia are not available, we don't know how huge the problem is in the country. We can, however, roughly estimate the prevalence based on data and knowledge documented in other countries such as data from Ahn et al. (2004). This can help comprehend the magnitude of the problem. Accordingly, using Ahn et al.'s estimate and given that there are about 42.7 million children

below the age of 14 in Ethiopia (Index Mundi, 2018), an estimated 2.1 to 6.4 million children may show signs of sensory processing deficits (excluding ASD and other developmental disorders).

Method

In this study, correlational and repeated measure designs were employed. Convergent and discriminant validity of the SPMP-AV were examined using a correlational design while test-retest reliability was studied using repeated measure design.

Participants and Sampling Techniques

This study involved two groups of participants: parents (for the home form) and teachers (for the school form) of typically developing children and children with developmental disorders. All children in both groups, aged from 2 to 5 years, were residents of Addis Ababa. Children in the typically developing group did not have any known/reported diagnosis of sensory processing problems. The normative sample of the Home form consisted of 676 children (but because 37 parents failed to return the questionnaire, this resulted in 639), whereas that of the School form consisted of 676 children. Also, both the Home and School forms were completed for 29 children who had been diagnosed with neuro-developmental disorders. The composition of the sample by sex and age is presented in Table 1 below.

Table 1: Demographic characteristics of the participants

Characteristic		Typically-developing children				Children with Special Needs	
	Sex	School Form		Home Form			
		N	%	N	%	N	%
Sex	Male	363	53.7	340	53.2	22	75.9
	Female	313	46.3	299	46.8	7	24.1
	Total	676	100.0	639	100.0	29	100.0
Age in months	24-36	71	10.5	71	11.1	9	31.0
	37-48	195	28.8	184	28.7	10	34.4
	49-60	410	60.7	384	60.0	10	34.3
	Total	676	100.0	639	100.0	29	100.0

We selected the group comprising typically developing children using stratified random sampling technique. First, we selected two sub-cities among the 10 sub-cities in Addis Ababa (that is Arada and Kirkos). Taking into account the number of available kindergartens (KGs) and day care centers in the two sub-cities, we then selected seven KGs from Arada sub-city and eight from Kirkos sub-city. From these 15 KGs and day care centers, a total of 676 children aged between 2 and 5 were randomly selected.

Unlike the typically developing group, there were a small number of children with special needs who were attending KGs and who were aged 2-5 at the time. Availability sampling technique was, therefore, used to draw the children with special needs. The 29 children were selected from four centers (Nehemiah Autism Center, Nehemiah Day Care, Joy Center for Autism, and Atse Libne Dingil Special Needs Class) which provide services to children with special needs.

Instruments

The SPM-P and Raven's Colored Progressive Matrix test (CPM) were used in the current study. The sensory Processing Measure Preschool (SPM-P) is a rating scale. It contains two forms: The Home and the School forms. The Home form was developed by Ecker and Parham (2010) and the School form was developed by Miller-Kuhaneck, Henry and Glennon (2010). The SPM-P is designed for children aged 2 to 5 years. Each form contains 75 items to be completed by the parent/caregiver and teacher/daycare provider respectively.

Both the Home and School forms of the SPM-P provide eight scaled scores: Vision, Hearing, Touch, and Body Awareness (nontechnical term for proprioception), Balance and Motion (nontechnical term for vestibular), Total Sensory System Score, Planning and Ideas (aka praxis), and Social Participation. Prior to data collection, a pilot study (including 37 participants for the School form and 31 participants for the Home form) was conducted to examine the reliability of both forms. The reliability coefficients for the total measures were found to be 0.97 and 0.91 for the Home and School forms respectively.

In addition to SPM-P, CPM was used to collect data on five-year-old participants' mental abilities. More specifically, CPM was employed to examine the SPM-AV's construct validity through the analysis of convergent validity based on Ayres's hypothesis that SPD/SID negatively affects one's mental abilities (Ayres, 1979). CPM was used because it was less culturally sensitive and thus more appropriate for the purpose of this study than other available measures.

Among other things, CPM evaluates the child's spatial awareness and the degree to which he or she is able to put pictures, shapes or patterns in a

correct order so as to form methodically-connected entities. According to Raven, Court, and Raven (1990), the CPM is a trial which does not involve or use words/speech, it exclusively focuses on visual items and intends to evaluate the principal cognitive procedures of which children under 11 are more often capable of than not. The test consists of three sub-sets (A, AB, B), each containing 12 items and 36 problems in total. In the present study, a pilot test with 10 children aged 5 has yielded a reliability coefficient of .931 for the total set as well as .725 (subset A), .882 (subset AB) and .839 (subset B).

Procedure

In this study, the researchers started with the adaptation of the English version of the SPM-P by translating it into Amharic. The translation process involved four experts – two psychologists and two English and Amharic language experts – and one person drawn from a different sector. First, the (forward) translation from English to Amharic was done separately by a psychologist and an English language expert. Second, a backward translation was done by another psychologist and an Amharic language expert. Third, an initial meeting of the four experts was held in order to review the equivalence of the translations and from that, a compiled version was produced. Finally, prior to the final meeting of experts, the compiled Amharic version of the questionnaire was *blindly* translated backward to English by an expert in English Language and Literature.

Finally, the experts were invited to prepare a final consolidated version based on their previously compiled version and on the *blind* translation effected by the fifth person. Throughout this process, no major changes on the items contained in both forms were made. However, items that contained culturally or environmentally inappropriate components were modified to reflect the reality in Ethiopia. For example, use of objects, foods or activities uncommon or widely unavailable in the Ethiopian context (e.g., raincoat, pizza, toilet flushing, elevator, sound of the

refrigerator/microwave, use of train or tricycle) were translated contextually. This means that they were replaced with equivalent components that are widely common to the Ethiopian context. Following completion of the translation, a pilot study was conducted as indicated above.

Prior to collecting the pilot data and data for the main study, permission to conduct the study was first secured from all the KGs and day care centers (15). Then, parents/caretakers and teachers of the children were invited to complete the SPMP-AV of the Home and School forms respectively, following a brief introduction by the data collectors on the purpose of the study and on standard procedures to follow in completing the questionnaire. The respondents were given one week to complete both forms. For estimation of the test-retest reliability, participants were assessed twice using the same form: an initial assessment and a second assessment two weeks later.

Data analysis

Different statistical tests were employed for data analysis. Whereas paired-samples t-test was used to compare scores on the Home and the School forms of the SPMP-AV, Pearson's r was used to determine the test-retest reliability of both forms of the SPMP-AV. Pearson's r was also used to correlate the scores on the CPM with that of the Home and School forms of the SPMP-AV as evidence of convergent validity of the SPMP-AV. Further, multivariate analysis of variance was employed to examine the discriminant validity of the SPMP-AV through the examination of group differences (between typical children and children with special needs) in the subscales of the SPMP-AV. Finally, construct validity was assessed using the Principal Axis Factoring method to determine the dimensionality of the data using varimax rotation. All the analyses were conducted using SPSS version 20.

Results

Internal consistency

Analyses of the SPMP-AV Home Form Assessment revealed moderate to high internal consistency reliability for the subscales (ranging from .52 to .93) and the Total Sensory System (TOT) (*r*= .93; see Table 2). Reliability estimates for the SPMP-AV School Form ranged from .64 to .90 for the subscales; for the Total Sensory System (TOT), it was .92 (see Table 2).

Table 2: Internal consistency estimates of the SPMP-AV

Subscale/scale	Home Form (n=639)				School Form (n=676)			
	No. of items	α (Original Measure)	α (Pilot Study)	α (Main Study)	No. of items	α (Original Measure)	α (Pilot Study)	α (Main Study)
Social participation (SOC)	8	.89	.84	.77	10	.93	.86	.86
Vision (VIS)	11	.82	.84	.77	10	.79	.85	.80
Hearing (HEA)	9	.81	.75	.81	10	.79	.83	.80
Touch (TOU)	14	.79	.87	.80	10	.76	.62	.72
Body awareness (BOD)	14	.76	.80	.79	10	.89	.93	.90
Balance and Motion (BAL)	11	.75	.89	.85	10	.72	.66	.85
Planning and Ideas (PAL)	9	.93	.93	.84	10	.94	.76	.84
Taste and Smell (TANS)	4	.93	.52	.59	5	.94	.72	.64
Total sensory system (TOT)	75	.89	.96	.93	75	.93	.89	.93

Test-retest reliability

The test-retest reliability coefficients of the SPMP-AV were good to excellent. The intra-class correlation coefficient (that is, the correlation between scores obtained at two points in time on the same measure) of the Home form was found to range from .83 to .96, whereas that of the School Form ranged from .87 to .93 (see Table 3).

Table 3: Intra class coefficient estimates of the SPMP-AV

	Intra class correlation coefficient	
Subscales/scale	**Home Form (n=31)**	**School Form (n= 31)**
Social participation (SOC)	.917	.931
Vision (VIS)	.847	.903
Hearing (HEA)	.825	.879
Touch (TOU)	.939	.879
Body awareness (BOD)	.963	.924
Balance and Motion (BAL)	.902	.882
Planning and Ideas (PAL)	.958	.897
Taste and Smell (TANS)	.852	.871
Total sensory system (TOT)	.980	.945

Exploratory Factor analysis

For the Home and School forms, the scree plots suggested 2 to 9 and 4 to 9 factor solutions respectively. Factor analysis was conducted using Principal Axis Factoring method with varimax rotation. A four-factor analytic solution provided the most interpretable pattern of loadings for both home and school forms. We excluded items with factor loadings

lower than .30 during rescaling. Based on our analysis (factor analysis), the SPMP-AV was reduced from 8 subscales to 4 (both home and school forms). Items were reduced from 75 to 60 for the home and to 70 for the school form. As shown in Table 4 below, reliability analysis of the four factors demonstrated good internal consistency (coefficients range from .77 to .93 for the home and from .86 to .91 for the school form).

Table 4: Internal consistency estimates of the SPMP-AV

Scale	Internal consistency	
	Home Form (n=639)	**School Form (n=676)**
Factor one	.93	.91
Factor two	.86	.91
Factor three	.82	.87
Factor four	.77	.86

Considering the meaning of the items and loadings under each factor, the structure of both forms was made to be similar. The four latent factors were named as follows: Perception and Praxis (Factor one), Seeking Behavior (Factor two), Sensory Responsivity (Factor three), and Social Participation (Factor four).

In the Home Form, the first factor for which 26 items were identified was labeled “Perception and Praxis.” The items which were loaded in the first factor originated mostly from the Planning and Ideas (PAL) and Balance and Motion (BAL) subscales of the English version of the SPM-P.

The second factor, labeled “Seeking Behavior” consists of 17 items most of which came from the Taste and Smell (TNS), Touch (TOU), and Body Awareness (BOD) subscales. The third factor labeled “Sensory

Responsivity" contains 13 items that mostly originate from the Vision (VIS) and Hearing (HEA) subscales. Finally, the fourth factor was entitled "Social Participation" and contains 8 items that all belonged to the Social Participation scale of the English Version of the SPM-P.

In the School form, the "Perception and Praxis" factor contains 27 items originating from the Planning and Ideas (PAL) and Balance and Motion (BAL) scales. The "Seeking Behavior" scale now contains 11 items that were mostly found under the Body Awareness (BOD) subscale. The "Sensory Responsivity" scale comprises 22 items while the "Social Participation" scale has 10. The majority of both of these scales' items were found under the Vision (VIS) and Hearing (HEA) subscales of SPM-P.

Convergent Validity

We assessed the convergent validity by comparing participants' (n=52) Total Sensory System scores of the SPMP-AV with their respective scores on the CPM (see Table 5). Participants' mean score for the Total Sensory System of the Home form was 236.57 with a standard deviation of 23.38 while it was 235.21 with a standard deviation of 25.95 for the School form. On the CPM, the participants' mean score was 17.38 with a standard deviation of 5.04.

Table 5: Participants' mean scores and standard deviation on SPMP-AV and CPM

Variables	Mean	SD	N	Intercorrelations		
				1	2	3
Raven'sColored Progressive Matrices	17.4	5.04	52	-		
SPMP-AV Home Form	236.6	23.4	52	.560	-	
SPMP-AV School Form	235.2	25.9	52	.828	.740	-

In addition, Pearson's correlation matrix illustrating the correlation of participants' (n=52) Total Sensory System (TOT) score of the SPMP-AV with their respective score on the CPM, shows that the respective correlations for both the Home and School forms is statistically significant at α=0.01 level, (2-tailed). Pearson's correlation between the School form and CPM was high (r=.83, p=.001). On the other hand, the correlation between the Home form and CPM scores of participants turned out to be lower (r=.56, p= 001). The correlation results of both the Home and School forms with the CPM indicate that children who scored high in the SPMP-AV also scored high in the CPM.

Discriminant Validity

We assessed the discriminant validity by comparing scores of typically developing children (n=29) and scores of children with special needs (n=29). N is 29 due to the availability of children with special needs in the required age range. The Total Sensory System and subscale scores for both home and school forms (see Tables 6 and 7) of the typically developing group and that of the group comprising children with special needs were significantly different. In other words, the total scale and subscales of the two forms discriminated the two groups in a meaningful way as well as at a statistically significant level.

Table 6: Comparison of scale scores of the SPMP-AV between typically-developing children and children with Special needs groups: Home Form

	Typical developing children		Children with special needs			
Subscale/Scale	**Mean**	**SD**	**Mean**	**SD**	**t**	***p***
Social Participation (SOC)	18.10	5.34	14.58	3.62	2.93	.005
Vision (VIS)	31.10	6.93	25.72	11.6	2.14	.037
Hearing (HEA)	27.34	6.69	20.89	9.62	2.96	.004
Touch (TOU)	43.27	7.60	29.58	7.68	6.81	.001
Taste and Smell (TNS)	12.58	2.39	8.62	2.88	5.69	.001
Body Awareness (BOD)	27.37	5.22	20.06	4.92	5.48	.001
Balance and Motion (BAL)	34.51	6.62	22.89	7.99	6.03	.001
Planning and Ideas (PLA)	26.79	6.35	16.44	4.67	7.05	.001
Total Sensory System (TOT)	220.8	32.7	159.0	40.6	6.32	.001

Note: n=29

Table 7: Comparison of scale scores of the SPMP-AV between typically-developing children and children with Special needs groups: School Form

Subscale/Scale	Typical developing children		Children with special needs		t	*p*
	Mean	SD	Mean	SD		
Social participation (SOC)	21.65	7.85	17.27	4.72	2.57	.013
Vision (VIS)	29.41	6.80	21.75	5.96	4.55	.001
Hearing (HEA)	31.55	5.96	21.68	6.78	5.88	.001
Touch (TOU)	32.20	4.12	23.65	8.05	5.09	.001
Taste and Smell (TNS)	16.34	3.35	10.41	3.75	6.34	.001
Body Awareness (BOD)	32.51	5.91	20.31	7.01	7.16	.001
Balance and Motion (BAL)	33.00	4.99	19.86	8.38	7.25	.001
Planning and Ideas (PLA)	29.17	6.58	20.20	8.19	4.59	.001
Total Sensory System (TOT)	225.86	24.02	155.17	44.46	7.53	.001

Note: n=29 for each group

Discussion

Reliability coefficients

The results of this study revealed that both the Home and School forms of the SPMP-AV are reliable scales for use in the Ethiopian context. Both the home and the school forms had moderate to high internal consistency coefficients for all subscales and high internal consistency coefficients (.93 for each) for the total scale. This suggests that the items in the subscales of each form are relatively homogeneous.

High test-retest reliability of the subscales and the Total Sensory System of both forms demonstrated the SPMP-AV's acceptable stability over a

two-week period. Similar to the findings of this study, developers of the original SPM-P reported results of test-retest correlation coefficients which were all above .90, which also indicated excellent stability over a two-week period (Glennon, Kuhaneck and Herzberr, 2011).

The adapted scale (SPMP-AV) is therefore more or less similar with the original SPM-P in terms of both internal consistency and stability. This means that the scores have shown adequate stability over a two-week period just like the original measure. In a similar manner, the items of the adapted scale and its subscales have shown adequate level of internal consistency, a measure of homogeneity of items. These results suggest that the adapted scale (SPM-AV) can provide useful and reliable information that help teachers, counselors and practitioners make good decisions about children.

Discriminant validity

Significant differences were observed between the SPMP-AV scores of typically developing children and the SPMP-AV scores of children with special needs (Home and School forms). This means that the scale was able to discriminate between the two groups which is generally expected given one group comprises typically developing children while the second group comprises children with special needs. Similar to the finding of this study, Glennon et al. (2011) stated that the original SPM-P ensured effective discrimination between children with and children without clinical disorders. This finding is also consistent with findings by other scholars (e.g., Lai, 2013) who reported that children with Autism Spectrum Disorders (ASD) scored significantly higher (reverse scored) on the SPM as compared to their age and gender matched peers.

As demonstrated by several other studies (cited in Lai, 2013), children with ASD tend to have significantly more undesirable responses to daily sensory events than their normal peers which was reflected in their significantly lower scores on Dunn's Sensory Profile or its translated version. As cited in Brenda, Taku, Winnie, Louann and Matthew (2004), researchers reported significant differences in sensory processing and related behaviors in comparing children with autism and Asperger Syndrome with age-matched neurotypical peers. Furthermore, the above findings are supported by academic reports which show that sensory processing difficulties have higher rates of occurrence in children with special needs. More specifically, the estimated rates of sensory processing dysfunction among children with disabilities ranged from 40% to as high as 88% (Ahn et al., 2004; Talay-Ongan and Wood, 2000).

By discriminating children with special needs and their typically developing peers, the SPM-AV has demonstrated good discriminant validity evidence and is therefore useful as a measure that could be used when assessing sensory processing difficulties in Ethiopia. One should also note that the evidence applies to both the School and Home forms of the SPM-AV, which makes it even more useful particularly when assessment of children should be conducted in more than one setting.

Convergent validity

This study found statistically significant positive correlation between participants' scores on both the CPM and SPMP-AV Home and School forms. This indicates that children who scored low on the SPMP-AV also obtained low scores on the CPM and vice versa. Even though the overall correlation was statistically significant, the correlation between the Home form and the CPM was lower than the correlation between the School form and the CPM. This result is in line with Ayres's conceptualization of

SI and cognition. Ayres (1979) identified and conceptualized the relation between sensory processing, praxis and educational performance whereby sensory processing difficulties negatively affect children's abilities to function optimally in all environments. These difficulties can adversely affect a child's social skills, motor development and academic performance. Moreover, more recent studies confirmed that a child's academic, emotional and social functioning, which require utilization of higher cognitive processes, can be substantially impacted by sensory processing difficulties (Goodman, Scott and Lambert, 2015).

Exploratory factor analysis

Based on the suggestion of the scree plot, trials were made using principal axis factoring to extract factors that have considerable grouping of items with meanings and acceptable explained variance. Some of the results showed factors that explained more than 50% of the total variance but with unacceptable grouping of items with no meaning and vice versa. Factor analysis offers not only the possibility of gaining a clear view of the data, but also the possibility of using the output in subsequent analyses (Field, 2000; Rietveld and Van Hout, 1993). Therefore, it was decided that the four-factor solution was the most appropriate solution considering loading of items, meaning of categorization, concepts of regulation and sensory modulation in different phases of sensory processing and functional performance.

For both the Home and School forms in the four-factor solution, items were regrouped differently from the original grouping of items in the SPM-P except the fourth factor entitled "Social Participation" which has the same item loading as the "Social Participation" subscale (SPM-P) in both the Home and School forms. Therefore, the four factors extracted using the four-factor solution were named "perception and praxis," "seeking

behavior," "sensory sensitivity" and "social participation." One of the three dimensions of measurement realized in the structure of the SPM-P is the assessment of sensory vulnerabilities, which consists of describing clinical information on potential processing vulnerabilities within each sensory system (under/over responsivity, sensory seeking and perceptual problems). This means that, regardless of the type of sensory input, a child may have one or multiple of the above vulnerabilities. For example, a child can have sensory seeking tendency to visual stimuli only or visual and proprioceptive stimulation and other types of stimulus. Related to this, sensory integration vulnerabilities can also be related to each other (e.g., proprioceptive can be related to perception and sensory seeking behavior) (Kuhaneck, Henry and Glennon, 2015).

In the SPM-P, even though items were grouped into eight subscales in accordance with the seven sensory systems as well as praxis and social participation (BOD for proprioception, BAL for vestibular, HEA for auditory, VIS for visual, TOU for tactile, PLA for praxis, TNS for gustation and olfaction), most of the items in these subscales were linked with the aforementioned four vulnerabilities. In both forms of the SPMP-AV, the items which loaded into each factor were not typically similar. Nevertheless, the meaning they produced was generally similar. In the Home form, items which were loaded into the "praxis and perception" factor of the four-factor solution were mostly items from the PAL and BAL subscales of the SPM-P.

Similar to the items loaded in the Home form, the items loaded into the "praxis and perception" factor of the School form were mostly from the PAL and BAL subscales with additional items from the TOU subscale of the SPM-P. In the SPM-P, the PAL subscale was referred to as praxis. Some of the items loaded into the "perception and praxis" factor from the BAL subscale of the SPM-P were also items labeled as perception in the

SPM-P. Other items were considered appropriate enough to be loaded into the “perception and praxis” factor from the BAL subscale (Home form) and the TOU subscale (School form). This is acceptable as praxis is the process of getting the idea, initiating, and completing new motor tasks and is an end result of input from all the necessary sensory systems – which include the vestibular and tactile – and the brain (Kilhofiner, 2009).

As far as the “seeking behavior” factor of the SPMP-AV is concerned, the items loaded into it entirely originated from the BOD subscale for the School form and mostly originated from the BOD subscale as well as from other items of the TOU, VIS, BAL and TNS subscales of the SPM-P for the Home form. Seeking behavior refers to difficulties orienting to target stimulus for further processing and regulating behavior, and seeking stimulation in the environment. Collins and Miller (2014) asserted that sensory seeking or craving can be seen in relation with all of the sensory systems.

However, in this study, most of the items loaded into the “seeking behavior” factor on both forms did not originate from all of the sensory systems (especially in the School form, the items were loaded from the BOD subscale only). This could be due to the nature of behaviors exhibited by a child in relation with a given sensory system in both environments. Considering the nature of the Ethiopian classroom setting and the large number of students who are taught in a class, teachers are more likely to notice behaviors associated with movement or excessive physical activity while class is in progress than any other sensory system related behaviors (e.g., visual and auditory).

On the other hand, regardless of the sensory system and nature of the behaviors expressed by children, the diversity of items loaded into the “seeking behavior” factor of the Home form may also be due to the nature

of parent-child relationship. Considering the small number of children in one family and the length of time the child spends at home in the Western context, parents may have more chances to observe their child's behavior, including behaviors related to a wider variety of sensory systems (e.g., visual, tactile and auditory).

In both forms, most of the items loaded into the "sensory responsivity" factor originated from the HEA and VIS subscales of the SPM-P. Most of these items are associated with – and thus trying to assess – under- or over-responsiveness. Sensory responsivity refers to difficulties modulating sensory input and regulating behavior, and demonstrating under-or over-responsiveness towards sensory stimuli. Similar to sensory seeking, sensory responsivity could be observed in relation with all sensory systems.

Some studies conducted in the Western world showed that sensory responsivity could manifest itself as a result of disorientation/dysfunction in any of the sensory systems. On their initial pilot study to validate the "Sensory over Responsivity Assessment and Inventory Scales", Sarah, Schoen, Miller, Kathy and Green (2008) found sensory over-responsivity in relation with the tactile, auditory, visual, proprioceptive, olfactory, gustatory and vestibular sensory systems. Not only sensory over-responsivity but also sensory under-responsivity are linked to all of the sensory systems, sensory under-responsivity falling into the category of sensory modulation disorders.

Unlike the results revealed in other studies conducted in various Western cultures, most items of the "sensory responsivity" factor of the SPMP-AV were items related to the visual and auditory systems. Considering the above findings by other researchers, the differences in the loading of items into the "sensory responsivity" factor of the SPMP-AV may be

attributed to cultural and environmental differences. According to Brown and Dunn (2010), sensory processing patterns have both universal and context-specific qualities.

From a neurological point of view, the neurological threshold indicates the number of stimuli needed for the nervous system to notice or react to stimuli, while behavioral responses indicate the manner in which the child responds in reaction to the threshold. While behaviors are assumed to be reactions to neurological threshold, they can also be influenced by different external factors of which one could be related to culture. Stellar and Stellar (1985), for example, described several conditions they believed were necessary to produce goal directed behaviors: an internal environment that supports the behavior, an external environment that provides reasonable opportunities and a stimulus to trigger the behavior and opportunities to learn.

Throughout their developmental process, children learn and develop behavioral patterns, skills, interests, etc. and those are shaped in accordance with the specific culture they grow in. Therefore, the nature of a child's behavioral reaction towards neurological threshold may differ in function of culture. In addition, the nature, type and intensity of the sensory inputs/stimuli that contribute to triggering a neurological threshold can differ upon the physical environment of a specific population.

On the other hand, the raters' perception of a given behavior may be different across cultures. For example, an abnormal behavior in a given cultural context may be deemed normal in another. For the "social participation" factor of the SPMP-AV, all items in both forms originated from the SOC subscale of the SPM-P. For this factor, no differences were observed between the Home and School forms of the English and Amharic versions of the SPM-P. Consistent with the findings of the current

study, Lai (2013) found that items loaded into the “social participation” factor of the Sensory Processing Measure Hong Kong Chinese Version (SPM–HKC) were the same as the items originating from the “social participation” subscale of the original SPM.

In both the Home and School forms, some items were cross-loaded into two different factors. Some of the cross-loaded items were not retained and some of them were retained based on their nature, the intensity of their loadings and interpretation difficulty of the factor they are loading on. According to Costello and Osborne (2005), cross-loading happens when an item loads at .32 or higher on two or more factors. Depending on the design of the study, a complex variable (i.e., an item that is in the situation of cross-loading) can be retained with the assumption that it is the latent nature of the variable, or the complex variable can be dropped when the interpretation is difficult.

Sensory processing involves three phases. First, the receptive phase through which sensory input is captured and registered; second, the throughput phase in which the registered sensory input is held and updated; and last, the responding phase, which refers to the process of making a response toward the sensory input that is relevant to the situation (Sokolov, Spinks, Naatanen, and Lyytinen, 2002). According to the identified phases of sensory processing, the factor analysis of this study showed that the “seeking behavior” and the “sensory responsivity” factors covered the receptive and responding phases while the “perception and praxis” factor addressed the throughput and responding phases of the sensory processing process. Children’s social participation performance may or may not be caused by deficits in sensory processing. The “social participation” factor addressed the functional performance of children in the environment.

Conclusion

The validation study showed that the SPMP-AV is a stable and reliable test of sensory integration. Besides, convergent validity analysis showed that both the school and home forms of SPMP-AV had statistically significant association with the CPM. Furthermore, children with special needs and their typically developing peers were shown to be significantly different on both forms of the SPMP-AV, indicating that the SPMP-AV is able to discriminate the two groups. That is, both forms have good discriminant validity. Overall, because both the Home and School forms of the SPMP-AV have adequate psychometric characteristics, the tools can be used to screen children with Sensory Processing Disorders in the Ethiopian context.

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Appendix A

Table 1: *Rotated Factor Matrix of the SPMP-AV: Home Form*

	Item number and scale	Factor 1	2	3	4
1	Item 68: የእለትተዕለትተግዳሮቶችንልብስመልበስወይምመተኛትየመሠሉትንድርጊቶችየሚከናወኑበትተገቢቅድምተከተልመከተልያደናግረዋል/ያደናግራታል	**.654**	.210	.119	
2	Item 75: ከመኪናመቀመጫመውረድምሆነከመኪናመቀመጫመነሳትይቸግረዋል/ይቸግራታል።	**.631**		.338	
3	Item 73: በጨወታውስጥአዳዲስሀሰቦችንለማምጣትይቸገራል/ትቸገራለች	**.628**	.123	.172	-.115
4	Item 72: ሌሎችልጆችንወይምአዋቂዎችኣንድንነገርበሚሰሩበትጊዜየሚሰራውንስራደረጃበደረጃመከተልይከብደዋል/ይከብዳታልለምሳሌየተለያየቀለምናቅርጽያላቸውየሚገጣጠሙነገሮችመደርደርጨወታላይሌላውሰውወይምልጅበገጠመበትመልኩመግጠምናመደርደርአለመቻልወይምመቸገር።	**.617**	.204	.133	-.137
5	Item 65: ሲነሳ/ስትነሳእናሲቀመጥ/ስትቀመጥአካሉን/አካልዋንያወዛውዛል/ታወዛውዛለች	**.601**	.203	.229	-.114
6	Item 71: የሚታዩተግባሮችንማስመሰልይቸገራል/ትቸገራለችለምሳሌየእንቅስቃሴጨዋታዎችበእንቅስቃሴየተደገፉዘፈኖች	**.598**		.105	-.183
7	Item 67: የተለያዩቁሶችንበአንድጊዜእንዴትማጓጓዝወይምመውሰድማወቅያዳግተዋል/ያዳግታታልወይምይቸገራል/ትቸገራለች	**.598**	.236		
8	Item 70: ብዙደረጃያላቸውንድርጊቶችማከናወንይቸግረዋል/ይቸግራታል።	**.582**	.242		-.106
9	Item 64: ለመቆምወይምለመቀመጥበሚሞክርበትወቅትሰዎችንእንዲሁምኢቃዎችንይደገፋል/ትደገፋለች	**.576**	.146	.248	
10	Item 66: ደረጃወይምዳገትመውረድይፈራል / ትፈራለች	**.550**		.269	-.126
11	Item 69: የተለመዱየእለትተዕለትተግዳሮቶችንልብስመልበስወይምመተኛትየመሠሉትንድርጊቶችየሚከናወኑበትተገቢቅድምተከተልመከተልያደናግረዋል/ያደናግራታል	**.529**	.192	.161	
12	Item 63: የመልፈስፈስናየእንቅስቃሴጥምረትችግርይስተዋልበታል/ባታል	**.526**		.453	
13	Item 62: ጭንቅላቱ/ቷቀጥብሎካለበትአካሀንሲዞርይጨነቃል/ትጨነቃለች	**.516**		.313	-.123
14	Item 58: ለማስተካከልበሚሞክርበት/በምትሞክርበትወቅትከወንበርይወድቃል/ትወድቃለ	**.497**	.147	.280	
15	Item 56: ደረጃመውጣትናመውረድ፣በሾዋሾዌመጫወት፣ሸርተቴመጫወትእናሌሎችመጫዎችንየመሳሉእንቅስቃሴዎችንበጣምይፈራል/ትፈራለች	**.476**		.283	-.144
16	Item 57: የሰውነትእንቅስቃሴንመጠበቅየሚጠይቁተግባሮችንማድረግአይፈልግ/አትፈልግምለምሣሌያልተስተካከል (ወጣገባ) መሬትላይመጓዝ	**.444**	.202	.244	

17	Item 74: ለመቆምወይምለመቀመጥበሚሞክርበትወቅትሰዎችንእንዲሁምእቃዎችንይደገፋል/ ትደገፋለች	**.428**	.290	.182	-.137
18	Item 11: ቁሶችንበቀለማቸው፣ በቅርፃቸውወይምበመጠናቸውያላቸውንተመሳሳይነትእናልዩነትለማወቅወይምለ መለየትይቸገራል/ ትቸገራለች	**.420**	.120	.343	
19	Item 35: ከዕድሜእኩዮቹበተለየመልኩጥርስመቦረሽትጠላለች/ ይጠላል	**.419**		.263	
20	Item 59: እራሱን/ሷንከመውደቅማዳንአይችልም/አትችልም	**.417**	.256	.207	-.114
21	Item 42: ከእድሜእኩዮቹበበለጠመልኩላህጩንያዝረከርካል/ ላህጫዋንታዝረከርካላች	**.416**		.362	-.133
22	Item 44: ሌሎችህፃናትምላሽሲሰጧቸውለሚችሉከባድሽታዎችትኩረትአይሰጥም/አትሰጥም ወይምአያስተውልም/አታስተውልም	**.414**	.259	.153	
23	Item 50: ቁሶችን (እንደእርሳስ፣ማንኪያ) ለመጠቀምእስኪቸገርድረስአላልቶ/ታወይምሳያጠብቅ/ሳታጠብቅይይዛል/ ትይዛለች	**.400**	**.313**	**.304**	
24	Item 10: አንድአቃከሌሎችነገሮችጋርከተቀላቀለወይአብሮከሆነለይቶለማውጣትይቸገራል / ትቸገራለች	**.384**		.372	
25	Item 55: ከሌሎችልጆችበተለየመልኩአሻንጉሊት፣ ልብስእናሌሌችቁሶችንያኝካል/ታኝካለች	**.335**	.279	.189	
26	Item 41: ፊትመታጠብወይምመጠረግይጠላል/ ትጠላለች	**.324**	.270	.178	-.106
27	Item 52: አብዝቶ/ታመዝለል	.102	**.647**		
28	Item 51: ከሌሎችልጆችበተለየመልኩአሻንጉሊት፣ ልብስእናሌሌችቁሶችንያኝካል/ታኝካለች	.102	**.639**		-.145
29	Item 48: እንደመግፋት፣መኮተት፣ ማንሳትእናመዝለልንበመሳሰሉድረጊቶችይሳባል/ትሳባለች		**.598**		
30	Item 14: ማብርያናማጥፋያውንበተደጋጋሚበመንካትመብራትማጥፋትናማብራትይወዳል /ትወዳለች		**.537**		
31	Item 25: የተወሰኑድምጾችበተደጋጋሚእንዲፈጠሩያደርጋል/ ታደርጋለችለምሣሌየመጸዳጃውሃበተደጋጋሚእንዲፈስበማድረግ፣ ጠረጴዛበመደብደብእንዲሁምየተለያዩየቤትእቃዎችንበማጋጨትወዘተ	.142	**.521**	.301	
32	Item 18: በእግርእየተጉዘ / እየተጉዘችበሚመለከታቸው/በምትመለከታቸውነገሮችበቀላሉሀሳቡይሰረቃል /ሀሳቧይሰረቃል		**.495**	.154	
33	Item 54: ሌሎችልጆችንይገፋል/ትገፋለችወይምይገጫል/ትጋጫለች	.264	**.487**	.116	-.129
34	Item 30: ከመነካትይልቅመንካትንይመርጣል /ትመርጣለች		**.475**	.115	
35	Item 12: ከዕድሜእኩዮቹበተለየመልኩቁሶችሲሸከረከሩወይምሲንቀሳቀሱመመልከትያዝናና ዋል/ ያስደስተዋል/ ያዝናናታል/ያሰደስታታል		**.467**		
36	Item 61: እራሱን/ሷንከሌሎችልጆችበበለጠመልኩያሸከረከራል/ታሸከረከራለች	.270	**.454**	.115	
37	Item 47: ቁሶችን (እንደእርሳስ፣ማንኪያ)	.282	**.386**	.237	

	ለመጠቀምእስኪቸገር/ክትቸገርድረስአጥብቆ/ቃይይዛል/ ትይዛለች				
38	Item 60: ሌሎችበሚሰላቹበትወቅትአይሰላችም/ አትሰላችም	.212	**.378**		
39	Item 32: ሌላሰውፊቱን /ፍቷንሲነካው/ሲነካትይበሳጫል/ትበሳጫለች	.163	**.376**	.128	
40	Item 15: በመንቀሳቀስላይያሉቁሳቁሶችን /ነገሮችበንሪጥማየትያዝናናዋል/ ያዝናናታል	.200	**.370**	.135	
41	Item 49: መቀመጥወይምቁሶችላይመቆምንበመሣሰሉእንቅስቃሴዎችወቅትምንያህልከፍወ ይምዝቅማለትእንዳለበትአርግጠኛአይደለም/ችም	.282	**.368**	.165	
42	Item 45: ሌላምግብእስከአለመብላትደረጃበሚያደርስመልኩወይምሁኔታየተወሰኑምግቦችን ጣዕምይመርጣል/ ትመርጣለች	.174	**.361**		
43	Item 43: የማይበሉወይምምግብያልሆኑእንደቀለምወይምማጣበቂያየመሠሉነገሮችንመቅመስይ ወዳል/ትወዳለች	.317	**.354**	.183	
44	Item 53: ከእንስሳትጋርበሚጫወትበት/በምትጫወትበትወቅትብዙጉልበትያወጣል/ታወጣለች	.223	**.315**	.125	-.110
45	Item 26: አንደፉጨት፣ ዋሽንትእናትራምፔትየመሰሉየፍጭትድምጾችሲሰማ/ስትሰማይረበሻል /ትረበሻለች	.301		**.637**	-.108
46	Item 24: በጀርባድምጾችበቀላሉይረበሻል/ ትረበሻለችለምሣሌከፍሎረሰንትመብራት፣ከፍሪጅወዘተየሚወጣድምጽ	.261	.155	**.598**	
47	Item 27: ከተጨናነቀቤትእናከመስሉትለምሳሌድግስባለበትቤትየሚወጡየተጨናነቁድምጾችያ ጨናንቁታል /ያስጨንቆታል	.165	.111	**.557**	-.105
48	Item 20: በተለመዱየቤትውስጥድምፆችበቀላሉይረበሻል/ ትረበሻለችለምሣሌበባልዲከቧንቧውሃበሚቀዳበትጊዜየሚፈጠርድምፅ፣ድስት፣ ሳህንወዘተሲወድቁየሚፈጥሩዋቸውድምጾች	.183	.135	**.542**	-.103
49	Item 23: ለሌሎችሰዎችለማይሰሙ /በማይስተዋሉድምጾችይረበሻል/ ትረበሻለችወይምበእጅጉይመሰጣል/ትመሠጣለች	.217	.177	**.531**	-.103
50	Item 22: የተወሰኑድምጾችንአይሰማም/ አትሰማምአይመስልም/አትምስልም	**.302**		**.504**	
51	Item 21: ጮክላሉድምጾችበአሉታዊመልኩምላሽይሰጣል/ ትሰጣለችለምሳሌከቦታውመሸሽበማልቀስወይምጆሮንበመያዝ		.222	**.501**	
52	Item 9: ብርሃንይረብሸዋል /ይረብሻታል፣በተለይደማቅብርሃን (አይንማርጉበጉብ፣ ማጭበርበርአይንመክደንወዘተ)	.156	.128	**.406**	
53	Item 16: ዕይታውስጥየሚገቡብዙነገሮችባሉበትሁኔታአንድንነገርበአትኩሮትለማየትይቸገራል/ ትቸገራለች	.310	.174	**.383**	
54	Item 28: ጮክያለወይምያልተጠበቀድምጽሲሰማ /ስትሰማይደመማል/ትደመማለች	.145	.351	**.382**	
55	Item 17: ብዙዕይታውስጥየሚገቡነገሮችያሉበትስፍራለምሳሌየተጨናነቀከፍልወይምብዙቁ ሶችያሉበትስፍራወይምመጋዘንያስጨንቁታል/ ያስጨንቋታል	.256	.188	**.369**	-.116
56	Item 19: ብዙየሚታዩነገሮችባሉበትሁኔታቀላልተግባሮችንለማከናወንይቸገራል /ትቸገራለች	.289	.184	**.363**	-.113
57	Item 13: ከነገሮችወይምከሰዎችጋርበቦታውእንደሌሉአርንበማሰብሄዶይጋጫል/ ትጋጫለች	**.335**	.122	**.342**	

58	Item 5: በተገቢውመልኩየቢተሰብሸርሸርላይይሳተፋል/ትሳተፋለችለምሳሌወደፓርክወይምሙዚየምመሄድ	-.104		**.702**
59	Item 6: በተገቢውመልኩቤተሰብበሚሰበሰብበትወቅትይሳተፋልለምሳሌበበዐል፣በሠርግእናበልደትየመሳሰሉትላይ	-.110	-.186	**.673**
60	Item 7: ከጉደኞቹጋርበሚደረጉእንቅስቃሴዎችለምሳሌየመጫወቻቁሶችንበመጠቀምላይ፣ብስክሌትበመንዳትእናበመሳሰሉትላይበአግባቡይሣተፋል/ትሳተፋለች		-.201	**.567**
61	Item 1: ከጉደኞቹጋርበህብረትይጫወታል/ትጫወታለች	-.198		**.561**
62	Item 3: እየተደረገያለውንነገርሳይረብሸው/ሳይረብሻትወደጫዋታከሌሎችጋርይቀላቀላል/ትቀላቀላለች	-.182	-.102	**.499**
63	Item 2: ነገሮችንሲጠየቅማካፈልወይምያካፍላል/ታካፍላለች			**.456**
64	Item 4: ተገቢየሆኑየምግብሰዓትግንኙነቶችውስጥይሳተፋል/ትሳተፋለች			**.431**
65	Item 8: በቤተሰባዊእንቅስቃሴዎችላይይሳተፋል/ትሳተፋለችለምሳሌገበያበመሄድ፣ወንድምናእህቶችንከትምህርትቤትበማምጣትወዘተ			**.366**

Note: Perception and Praxis (Factor one), Seeking Behavior (Factor two), Sensory Responsivity (Factor three), and Social Participation (Factor four).

Appendix B

Table 2: Rotated Factor Matrix of the SPMP-AV: School Form

	Items number and Scale	Factor			
		1	2	3	4
1	Item 59: እንደእሸከርከሮሽ፣አባሮሽ፣ ሸርተቴያሉየእንቅስቃሴጨዋታዎችእጅጉንይፈራል/ትፈራለች	**.639**			-.140
2	Item 63: ከፍታያላቸውየመጫወቻሥፍራቁሶችያስጨንቁታል/ያስጨንቋታል	**.630**		.142	-.111
3	Item 64: አካሉን/ሏንበጣምራየማዘዝናየመጠቀምችሎታው/ዋዝቅተኛነው	**.623**		.175	
4	Item 65: አካሉን/ሏንወደትከከለኛእንቅስቃሴውስጥማስገባትይከብደዋል/ይከብዳታል (ማጨብጨብ፣እግርማጋጨት)	**.620**	.175	.156	
5	Item 74: ብዙደረጃዎችን (እርከኖች) ያሏቸውንተግባሮችንአይፈጽምም/አትፈጽምም	**.616**		.194	-.144
6	Item 70: አካላዊገለፃዎችንበትክክልማስመሰልይከብደዋል/ዳታል (ለምሳሌእንቅስቃሴየሚጠይቁጨዋታዎችን፣ በአካላዊእንቅስቃሴየታገዙዘፈኖች)	**.615**	.140	.102	-.201
7	Item 67: በጫወታወቅትአዳዲስሃሳቦችንለማመንጨትይቸገራል/ትቸገራለች	**.605**	.102		-.193
8	Item 72: የመጫወቻእቃዎችንበሚጠቀምበትወቅትትልልቅሰዎችወይምሌላልጅየሚሰራውንመድገምይከብደዋል/ዳታል	**.598**	.157	.182	-.192
9	Item 61: ቁሶችንከመሬትለማንሳትሲያነኑብስ/ስታነኑብስይንዳገዳል/ትንገዳገዳለችወይምይፈራል/ትፈራለች	**.590**	.208	.104	
10	Item 62: እራሱን/ሏንከመውደቅማዳንአይቸልም/አትችልም	**.560**	.152	.198	
11	Item 60: ከያዘው/ቸውጨዋታሌላሌሎችእንቅስቃሴዎችእንዲወገዱያለመጠንይጥራል/ትጥራች	**.558**	.206	.138	
12	Item 68: በእረፍትጊዜእንድጨዋታደጋግሞመጫወትእንጂእቅሙም/ሚምጨዋታንከበድአድርን/ጋአይጫወትም/አትጫወትም	**.551**	.138		-.168
13	Item 66: ሌሎችተግባሮችንበማስወገድአንድተግባርላይብቻሙጥኝይላል/ትላለች	**.527**	.236		
14	Item 57: በሚቆምምበት/በምትቆምበትወቅትግርግዳ፣ ፈርኒቸርወይምሰዎችንይደገፋል/ትደገፋለች	**.514**	.350		
15	Item 73: ለመሳል፣ ለመቁረጥወይምለመቀባትሁለቱንምእጆቹ/ቿለመጠቀምይቸገራል/ትቸገራለች (ማለትምእንደኛውእጁ/ጇሲሰራበሌላኛውወረቀቱንይይዛል)	**.502**	.193	.194	
16	Item 75: በእለትተለትተግባርውስጥየድርጊቶችንትክክለኛቅደምተከተሎችንይዞ/ዛመስራ ትአይችልም/ትችልም (የመማሪያቁሶችንበቦታውማኖር፣ ቆሻሻበአግባቡማስወገድ፣ወደቢትበመሄጃሰዓትልብሱንመልበስ) (ኮት፣ጃኬት)	**.496**	.102	.201	

17	Item 33: እጁን/ጇንበቀዝቃዛወይምበሙቅውሃመታጠብአይወድም/አትወድም	**.476**	.107	.213	
18	Item 58: በሚቀመጥበት/በምትቀመጥበትወቅትጠረጴዛላይበድንገትይደገፋል/ትደገፋለች ፣ጭንቅላቱን/ታንበእጁ/ጇይደግፋል/ትደገፋለች	**.468**	.203		
19	Item 36: የተወሰነይዘትያላቸውነገሮችየሚፈጥሩበት/ባትስሜትይደብረዋል/ራታል (የክፍልውስጥቁሶች፣ኮዳዎች፣የመመገቢያእቃዎችወዘተ…)	**.436**	.136	.298	
20	Item 45: አዳዲስምግቦችንመሞከርአይፈልግም/አትፈልግም	**.427**	.137	.218	
21	Item 35: ምራቅወይምምግብከፊቱ/ቷላይአይጠርግም/አትጠርግም	**.407**	.137	.270	
22	Item 34: ጓደኞቹበድንገትሲነኩትአይወድም/አትወድም (እራሱን/ሷንሊያልይችላል/ትችላለችወይምጥሎይሄዳል/ትሄዳለች)	**.407**	.119	.305	
23	Item 44: ሌሎችልጆችየማይጨንቃቸውየምግቦችጣዕምይደብረዋል/ይደብራታል	**.384**	.161	.249	
24	Item 37: የክትልብሶችንለመልበስፈቃደኛአይደለም/ችም	**.358**		.280	-.108
25	Item 31: በሌሎችመነካትይጠላል/ትጠላለች (ለምሳሌመታቀፍወይምመኮርኮርአለመፈለግ፣በሰልፍላይእጅንመያዝአለመፈለግ)	**.350**	.126	.321	
26	Item 71: ሌሎችንከማስመሰልይልቅየራሱን/ሷንጨዋታመጫወትይመርጣል/ትመርጣለች	**.338**	.229	.115	
27	Item 40: የጥፍርቀለም፣አሸዋ፣ጭቃ፣ማጣበቂያ፣ ሽከላበመሳሰሉየሚያቆሸሹነገሮችመጫወትወይምመንካትይጠየፋል/ትጠየፋለች	**.337**		.136	.158
28	Item 49: ባልተገባሃይልበርይከፍታልይዘጋል/ትዘላለች	.156	**.720**	.138	-.107
29	Item 51: ከጓደኞቹ/ቿጋርከመጠንበላይይጋፋል/ትጋፋለች (ለምሳሌበሰልፍላይወይምበመጫወቻሥፍራ)	.136	**.718**	.219	
30	Item 48: ያለመጠንይዘላል/ትዘላለች፣ ከከፍታላይአደጋበሚያስከትልመልኩመዝለልይፈልጋል/ትፈልጋለች		**.706**	.163	
31	Item 50: በቁሶችበሚጫወትበት/በምትጫወትበትወቅትያልተገባሃይልይጠቀማል/ትጠቀማለች (ለምሳሌየሙዚቃመሳሪያማጋጨትወይም…)	.239	**.687**	.174	
32	Item 54: የሌሎችልጆችንሥራያፈርሳል/ታፈርሳለች (ለምሳሌግንባታ፣ የተደረደሩቁሶችን፣መጫወቻመኪናዎችን)	.269	**.671**		
33	Item 46: ወንበርበግድየለሽነትይንትታል/ትንትታለች (ወንበርንጠረጴዛስርመግፋትወይምባልተገባሃይልወንበርመንተት)		**.661**	.216	-.136
34	Item 53: የምግብናየመጠጫቁሶችንበግድየለሽነትይይዛል/ትይዛለች (ቁሶቹንያጣምማል/ታጣምማለች፣ ይሰብራል/ትሰብራለችወይምይደፋል/ትደፋለች)	.345	**.653**		-.164
35	Item 47: በድንገትእርሳስ፣እስኪራቡቶ፣ ጠመኔይሰብራል/ትሰብራለችወይምባልተገባሃይልወረቀትይቀዳል/ትቀዳለች	.248	**.650**	.131	-.147
36	Item 52: ልብሱን/ሷን፣እርሳስ፣ ጠመኔወይምየክፍልውስጥቁሶችንያኝካል/ታኝካለችወይምወደአፉ/ፏያስገባል/ታስገባለች	.262	**.610**		-.102
37	Item 56: ቁሶችላይያለመጠንይዝዋዥዋል/ትንዝዋዥዋለችይዟዟራል/ትዟዟራለችወይምይሽከረከራል/ትሽከረከራለች	.248	**.597**	.159	
38	Item 55:	.305	**.483**		

	መቀስሲጠቀም/ስትጠቀምባልተገባሃይልበተደጋጋሚይከፍታል/ትከፍታለችይቆርጣል /ትቆርጣለች				
39	Item 14: በጠረጴዛወይምወንበርላይከሚገኙበዙቁሶችመሃልየፈለገውንቁስማግኘትያዳግተዋል /ያዳግታታል	.235	.141	**.595**	
40	Item 13: ከፍሉንወይምየመጫወቻቦታውንበመቃኘትቁሶችወይምምስሎችየሚገኙበትንትክክለኛቦታመጠቆምይከብደዋል /ታል	.185		**.571**	
41	Item 24: ድምጽየሚመጣበትንትክክለኛቦታመጠቆምአይችልም/ አትችልም	.244		**.553**	
42	Item 25: ድምጽማሰማትበሌለበትየትምህርትከፍለጊዜድምጾችንያሰማል/ታሰማለችይዘ ፍናል/ትዘፍናለች፣ያላዝናል/ታላዝናለችወይምይጮኻል/ ትጮኻለች	.127	.349	**.547**	
43	Item 17: በመጫወቻሥፍራላይእየተጫወቱካሉሌሎችለጆችጋርበቦታውመኖራቸውንወ ይምእንዳሉባለማስተዋልይ,ጋጫል/ትጋጫለች	.217	.326	**.512**	
44	Item 16: ቁሶችንበቅርጽወይምበቀለምለማዛመድይቸገራል/ ትቸገራለች	.226	.214	**.509**	-.112
45	Item 26: የተወሰኑድምፆችንበተዳጋጋሚእንዲፈጠሩያደርጋል/ ታደርጋለች (ለምሳሌቆርቆሮመደብደብ)	.121	.374	**.495**	-.144
46	Item 12: በቅርብበሚገኙቁሶችወይምሰዎችሃሳቡ/ቧይሰረቃል (ሥዕል፣ ግርግዳላይያሉቁሶች፣መስኮት፣ሌሎችልጆችወዘተ…)		.187	**.493**	
47	Item 27: ሌሎችየሚገነዘቡዋቸውድምፆችንመገንዘብያዳግተዋል/ታታል	.322	.127	**.492**	-.132
48	Item 19: ከዕድሜአቻዎቹ/ቿበበለጠመልኩየሚሽከረከሩወይምየሚንቀሳቀሱቁሶችንመመልከት ያስደስተዋል/ ያስደስታታል		.144	**.467**	
49	Item 18: ወደሰዎችወይምቁሶችአትኩሮይመለከታል/ትመለከታለች	.124	.200	**.462**	
50	Item 22: ሌሎችሲዘፍኑወይምየሙዚቃመጫዎቻዎችሲጫወቱሲደብተው/ታትይስተዋላል	.301		**.459**	
51	Item 21: ጮክያለድምጽሲደብተው/ታትይስተዋላል (የሚፈርስሀንፃ፣ የሌሎችህፃናትለቅሶወይምጩህት፣ድምጽየበዛበትመንገድወዘተ…)	.297		**.459**	
52	Item 15: አስተማሪበሚያስተምርበትወቅትከፍሉንወይምጓደኞቹንይቃኛል/ ትቃኛለች		.230	**.452**	
53	Item 28: ከፍሉውስጥጫጫታበሚበዛበትወቅትትኩረትመስጠትአይችልም/አትችልም	.219		**.443**	-.147
54	Item 20: የሚንቀሳቀሱነገሮችንበጎሪጥማየትያስደስተዋል/ ያስደስታታል	.164	.182	**.434**	-.102
55	Item 30: በሌሎችትኩረትበማይሰጣቸውየጀርባድምጾችይጨናነቃል/ትጨናነቃለችወይምቅሬ ታያሰማል/ታሰማለች	.336	-.106	**.432**	
56	Item 11: ጠንካራየፀሃይብርሃንወይምየከፍልውስጥሙቢራትንበተመለከተያማርራል/ ታማርራለችዓይኑን/ኗንይጨምቃል/ትጨምቃለች፣ ዓይኑን/ኗንይከልላል/ትከልላለች	.147		**.413**	.139
57	Item 29: ቃላዊትዕዛዞችንመከተልአይችልም/አትችልም	.323		**.411**	-.138
58	Item 42: ያልተለመዱወይምጠንካራየሆኑሽታዎችንመገንዘብአይችልም	.317	.202	**.341**	-.111

	(ማጣበቂያ፣ቀለም፣ማርከርወዘተ…)				
59	Item 23: በክፍልውስጥያሉአዳዲስድምፆችንአይገነዘብም/አትገነዘብም	.183	-.222	**.322**	
60	Item 43: የሳሙናሽቶ፣የፀጉርቅባትወይምየገላቅባትሽታይከብደዋል/ይከብዳታል	.303	.140	**.306**	
61	Item 4: በቀላሉወደአዳዲስተግባሮችይሸጋገራል/ትሸጋገራለች	-.126			**.732**
62	Item 3: ክብበመሥራትበሚደረጉተግባሮችውስጥበአግባቡይሳተፋል/ትሳተፋለች		-.145	-.133	**.686**
63	Item 9: በፈጠራጨዋታዎችከጓደኞቹ/ቿጋርበጣምራይጫወታል/ትጫወታለች	-.252			**.672**
64	Item 8: ከአቻዎቹጋርለጋራጥቅምበህብረትይሰራል/ትሰራለች (ለምሳሌበማዕዳትወቅት፣ቁስየመደርደርጨዋታ)	-.156			**.665**
65	Item 2: ተራውን/ዋንይጠበቃል/ ትጠብቃለች		-.195	-.111	**.636**
66	Item 6: የከፍልውስጥህግናየተለመዱተግባሮችንይከተላል/ ትከተላለች		-.179	-.112	**.630**
67	Item 7: የከፍልውስጥመጫዎቻዎቹንእናቁሶችንሲጠየቅ/ስትጠየቅጊዜያጋራል/ ታጋራለች		-.195		**.624**
68	Item 1: ከዕኩዮቹ/ቿጋርየተለያዩጨዋታዎችንእናአንቅስቃሴዎችንበፍቃደኝነትይጫወታል/ትጫወታለች	-.267	.114		**.597**
69	Item 5: በመካሄድላይያለውንእንቅስቃሴንሳያውክ/ሳታውክከአቻዎቹ/ቿጋርይጫወታል/ትጫወታለች		-.175		**.591**
70	Item 10: ያለአስተማሪጣልቃገብነትበጓደኞቹመሃልየሚፈጠሩግጭቶችይፈታል/ትፈታለች				**.496**

Note: Perception and Praxis (Factor one), Seeking Behavior (Factor two), Sensory Responsivity (Factor three), and Social Participation (Factor four).