

## THE SAUDI PEDIATRIC OCCUPATIONAL THERAPY TEST (SPOTT): PRELIMINARY DEVELOPMENT AND VALIDATION OF A SAUDI TEST FOR PRESCHOOL-AGE CHILDREN

Lamya AlAbdulkarim<sup>1\*</sup>, Kanika Wadhani<sup>2</sup> and Aseel AlOmair<sup>3</sup>

<sup>1</sup>Dr., King Saud University, Saudi Arabia, [laalabdulkarim@ksu.edu.sa](mailto:laalabdulkarim@ksu.edu.sa)

<sup>2</sup> Ms., King Saud University, Saudi Arabia, [kwadhani@ksu.edu.sa](mailto:kwadhani@ksu.edu.sa)

<sup>3</sup>Ms., King Saud University, Saudi Arabia, [asalomair@ksu.edu.sa](mailto:asalomair@ksu.edu.sa)

\*Corresponding author

### Abstract

Background: There are no validated occupational therapy clinical assessments for Saudi Arabic children which could present clinical challenges for occupational therapists to provide evidence based practice. Researchers also need a valid tool for evidence based research. Aim: the study aims to develop and validate a methodologically accurate clinical evaluation instrument for occupational therapy that is fit for Saudi Arabic children. Methods: A review of literature and internationally validated clinical tests in occupational therapy was conducted by experts. Constructs and items that are best fit for the local needs of Saudi preschoolers were developed. A tool was designed with two constructs of sensorimotor integration and visual perception and visual motor integration, ten themes and a total of 52 items. One hundred and ten 3 to 6 years old typical children were tested by the tool at their preschools. Face, content and construct validity and internal consistency were calculated. Results: Excellent Cronbach's  $\alpha$ , CVI and good face validity were obtained. Factor analysis revealed 13 factors. Conclusions: the tool was a valid and reliable fit for this cultural group that could be useful for identifying children at risk for occupational disorders and related conditions, in a mainstream non-clinical population.

**Keywords:** occupational therapy, clinical assessment, Saudi Arabia, gross-motor, fine-motor, visual-motor integration, pediatric

### 1 INTRODUCTION

Occupational therapists help children with disabilities to participate in their environments including school and home as well as helping children with injuries to recover and improve their skills (AOTA, 2016). To provide reliable quality assessment, an occupational therapist needs a valid clinical assessment (Polit, 2009) tool that fits the demographics and cultural specificities of children receiving the services. Researchers have recommended that the social, cultural and neurocognitive aspects of a population should be considered in a

test (Vygotsky, 1978; Resnik et al., 1991). Additionally, identifying effective therapy programs requires a validated outcome measurement to capture a child's behaviors improvement. To date, there is no validated clinical tool in occupational therapy for the assessment of Saudi children. Cross-cultural standardized clinical tests are psychometrically considered not reliable and valid to assess Saudi children because of the variation of culture and ethnicity; hence there is a great need for a test validated on Saudi children's occupational skills for the importance of those skills in a child's development through engagement in life daily activities.

Development of occupational scales is useful for therapeutic and educational programming. Occupational therapists can help preschool and kindergarten teachers to organize the classroom activities to help children develop the readiness skills needed for motor and visual perception and motor- visual integration. Developing and validating locally reliable measurement instruments yield valid data for researchers in occupational therapy in Saudi Arabia that may be used for sampling, concurrent validity tests, and outcome measurement of intervention programs.

The aim of this study was to develop and validate a reliable assessment instrument that conforms to guidelines for clinical test development to enable the use of valid assessments of clients by the occupational therapy profession in Saudi Arabia.

## **2 METHODS**

### **2.1 Context and setting of the study**

The study was conducted in Riyadh, Saudi Arabia at public and private preschools. The study obtained approval from the committee of scientific research ethics at King Saud University. Approval from the Ministry of Education was granted from the Department of Planning. Consent of parents was obtained through each school administration.

### **2.2. The study design**

A prospective cross-sectional design was used to evaluate the validity and internal consistency of the pediatric occupational therapy instrument for Saudi children.

### **2.3 Participants**

The sample recruited was of Arabic monolingual typically developing Saudi preschool children of different socioeconomic status with no history of communication, neurodevelopmental, sensori-motor, cognitive or socioemotional delays or disorders. Teachers' reports, parents' reports to school administration and observations of 3 international and national expert clinicians were used as source of data for typicality of children. All children participated voluntarily. All children identities were processed with confidentiality by assigning a number code for each child for further reference. Children were selected randomly from classrooms in different preschools in Riyadh region.

### **2.4 Instrument, data collection, and procedures**

Following a thorough review of the literature, three internationally and nationally expert clinicians and a research expert designed the test framework and developed a 51 items test. The test consisted of two major construct, namely, sensory- motor integration and visual perception and visual-motor integration. Each construct consisted of different themes: gross-motor, fine motor, bilateral coordination, tactile discrimination, eye-hand coordination, copying, perception, visual closure, and draw a person. A scoring scale was developed for each item with scores from 3 for complete target behavior to 0 of lack of behavior. A procedures manual was written for standardized test administration and a scoring record was included. Uniform culturally and developmentally appropriate materials across examiners were prepared for the test.

Data was collected from each child at her preschool in an open comfortable space with minimum environmental noise or distractions where children were seated at a child friendly tables and chairs for relevant tasks. Two examiners administered the test for each child for reliability of scoring. Data were recorded synchronically at the time of testing by both examiners. Once a test is completed, the two examiners review and validate the scoring and coding of data. A criterion of no less than 85% reliability was set for scoring and coding reliability. Then the validated data was entered in excel© spreadsheets on googledocs©. An expert clinician supervisor reviewed and validated the data entry. Reliability was greater than 85%.

### **2.5 Analysis methods**

Face validity of the instrument was reviewed by two international expert scholars in occupational therapy, 5

clinicians and 25 senior student clinicians. The test content validity was established by 4 experts in occupational therapy as a step to enhance its construct validity (Haynes, Richard, & Kubany, 1995). The experts rated the relevance of each item to the behavior domain on a 4-point scale with 1= not relevant, 2= somewhat relevant, 3 = quite relevant, and 4= highly relevant; calculation of this rating yields content validity index (CVI) (Davis, 1992). The review process determined whether the items fit the designed constructs, themes and the objectives of the test (Anastasi & Urbina, 1997; Foxcroft, Paterson, le Roux & Herbst, 2004) and were consistent with the criteria for content and face validity (Benson and Clark, 1982). Following the content validation process, four clinicians and twenty five senior student clinicians in occupational therapy received training and administered the test to validate the clarity and suitability of the items and scoring to the user. Hence, face validity was obtained (Hefford et.al., 2011).

Excel© 2010 spread sheet on googledocs© was used to enter, store, validate and export raw item scores data to SPSS (SPSS, Inc., Chicago, IL) Version 19.0. Raw data was exported to SPSS for generation of descriptive statistics and statistical analyses. To test internal consistency reliability the Cronbach's  $\alpha$  (Cronbach, 1951) was used as the most widely applied index (Spiliotopoulou, 2009). To test construct validity of the instrument, factor analysis both exploratory and confirmatory was performed to assess psychometric properties of the test. Factor analysis helps to identify the underlying factors between the measured variables and the test constructs, thereby helping to form and refine the test theoretical framework (Pett, Lackey, and Sullivan, 2003; O'Brien, 2007). To evaluate the suitability of SPOTT dataset for factor analysis, the measure of sampling adequacy, Kaiser-Meyer-Olkin (KMO), and the test of sphericity, Bartlett, were applied. Both measures indicate the strength of the relationships among the test items. KMO index of  $>0.5$  indicate that a factor analysis is applicable to the test's items dataset. A significance level of .00 for the Bartlett's test of sphericity indicates a strong relationship among the test's items' dataset, and hence a factor analysis of the dataset is viable. A test item is considered to perform a meaningful relationship to the underlying theoretical framework and constructs of the test, it must have a minimum criterion of 0.30 of loading on a factor ((Raubenheimer, 2004; Streiner & Norman, 1995; Nunnally & Bernstein, 1994).

### 3 RESULTS

#### 3.1 Participants

Typically developing monolingual Arabic speaking Saudi children with the age range of 3 to 6 years old enrolled in public and private preschools in Riyadh region voluntarily participated in the study. The sample of 110 children consisted of 50 females and 60 males with an average age of 4.8 years and months (standard deviation [SD] = 0.90).

**Table 1. Participants demographics (N = 110)**

Characteristics	N	%
Age (Years)		
3	25	22.7
4	32	29.1
5	53	48.2
Gender		
Female	50	45.5
Male	60	54.5

#### 3.2 Face validity results

The two occupational therapy international expert scholars reviewed the test and reported suitability and appropriate theoretical framework. Five clinicians and 25 senior student clinicians who administered the test for the first time after one session of training on the test administration reported satisfaction with ease of use, suitability of items and scoring indicating a good face validity which correlated with the content validity results.

#### 3.3 Content validity results

Content validity which measures the extent to which SPOTT represents all facets of skills within each domain showed a content validity index (CVI) of 3.45 indicating a good evidence of the degree to which the content of the test matches a content domain associated with the constructs.

### 3.4 Internal consistency results

The Cronbach's  $\alpha$  coefficient was .95 indicating excellent internal consistency of SPOTT. Kaiser-Meyer-Olkin measure of sampling adequacy for SPOTT was .80 which is over the threshold of 0.7. The Bartlett's Test of Sphericity was significant (Chi-Square = 3400.43, df = 122, p = .00) indicating that the ten test domains are not independent, and have a good level of correlation. Thus, factor analysis is suitable to be applied to extract component factors in the test.

### 3.5 Construct validity

Table 2 depicts the mean raw total test scores for children ages 3 to 5 years old. SPOTT included 51 items scored on a scale of 0 to 3 listed in Table 3. A total of 51 items were loaded on factor analysis using principal components analysis (PCA) with orthogonal Varimax rotation of the item scores. Thirteen factors were extracted as shown in Table 3. Since SPOTT measures multidimensional skills in occupational functions, it is expected that the items will load on different factors (bold faced loadings).

Exploratory factor analysis loaded a 51-item with a ten-factor solution (gross motor, fine motor, bilateral coordination, tactile discrimination, eye-hand coordination, copying, perception, visual closure, visual memory, and draw a person) that jointly accounted for 100.0% of observed variance. The confirmatory factor analysis indicated a good fit to the data. Factor analysis identified a thirteen-factor structure of the test. These factors displayed good internal consistency.

**Table 2. Mean raw total test scores of SPOTT (N = 110)**

Age (Years)	Mean	Standard Deviation
3	1.83	0.34
4	2.36	0.23
5	2.64	0.20
Over all Mean	2.37	0.40

**Table 3. Saudi Pediatric Occupational Therapy Test (SPOTT) Item Factor Analysis Rotated Component Matrix (N = 110)**

Item	1	2	3	4	5	6	7	8	9	10	11	12	13
A1	.195	.235	<b>.698</b>	.025	.132	-.079	.175	.028	<b>.346</b>	-.002	.074	.142	-.005
A2	.282	-.001	.236	.253	.261	.059	.168	<b>.502</b>	.095	.113	.097	-.043	.178
A3	.007	.274	<b>.734</b>	.138	.091	.193	.019	-.061	-.046	-.035	-.059	-.007	.064
A5	.137	-.042	<b>.690</b>	.056	.073	.051	.031	.068	-.083	-.051	-.008	-.254	.073
A6	.175	.250	<b>.585</b>	.052	.166	-.127	.162	.160	<b>.300</b>	-.040	.140	<b>.317</b>	.142
A7	.042	.072	.065	-.004	.115	-.100	.095	.275	<b>.744</b>	.269	-.074	-.059	.012
B8	.099	<b>.363</b>	-.047	.137	.203	.151	.084	-.067	<b>.507</b>	-.087	-.160	-.066	<b>.331</b>
B9	.166	.215	.172	<b>.339</b>	<b>.391</b>	.224	-.124	-.044	.071	-.099	-.059	.246	-.253
B10	.059	<b>.476</b>	<b>.327</b>	.061	.201	.130	.142	<b>.483</b>	.147	.112	.242	.053	-.086
B11	.212	<b>.722</b>	.136	.148	.268	.162	-.034	-.015	.130	.243	.124	.022	.076
B12	.051	<b>.563</b>	.158	-.057	.242	.127	.278	<b>.374</b>	.037	.150	.159	-.075	.040
B13	.189	<b>.771</b>	.215	.195	.147	.130	.086	.010	.172	.060	.038	-.055	.036
B14	-.072	<b>.362</b>	<b>.472</b>	<b>.311</b>	.099	.091	-.127	.175	-.023	.220	-.090	.153	-.092
B15	.020	.132	-.085	.102	.003	-.093	.080	-.033	.111	<b>.771</b>	.047	-.073	.028
B16	.017	.113	.013	-.020	.030	.008	.123	.020	-.051	.037	<b>.833</b>	-.059	.124
B17	.068	-.033	.040	-.203	-.040	.151	-.254	.248	-.096	.126	.154	<b>.560</b>	<b>.423</b>
B18	.058	-.022	-.043	.070	-.104	-.072	.104	-.036	.036	-.094	-.061	<b>.823</b>	.086
C19	.268	.135	.266	<b>.579</b>	<b>.312</b>	-.021	.135	.280	.036	.030	.053	-.100	.037
C20	<b>.471</b>	.063	<b>.333</b>	.283	.119	-.032	.199	<b>.387</b>	-.006	-.112	-.005	-.223	.007
C21	-.013	.125	.175	.088	.010	.084	.048	.134	.047	.017	.093	.158	<b>.781</b>
C22	.038	.088	-.033	.136	-.148	.127	.002	<b>.791</b>	.219	.017	.001	.043	.041
C23	.159	.097	.241	.145	.038	.040	<b>.673</b>	.237	.261	.036	.112	-.051	.191

C24	.188	.113	.049	.044	.187	-.098	.291	<b>.568</b>	.052	-.239	-.106	.039	.251
D25	.036	<b>.446</b>	.069	.068	<b>.486</b>	.002	.296	.110	-.002	-.044	-.006	-.107	.078
E26	.087	.229	<b>.416</b>	.188	.195	.181	<b>.551</b>	.182	.023	.147	-.022	.044	-.016
E27	.217	<b>.440</b>	<b>.306</b>	<b>.462</b>	.253	.163	<b>.337</b>	.148	.124	.156	.112	.038	.030
E28	.181	<b>.448</b>	<b>.333</b>	<b>.531</b>	.158	.082	.220	.190	.184	.058	.012	-.012	.086
E29	.259	<b>.438</b>	<b>.307</b>	<b>.581</b>	.146	-.036	.192	.118	.173	.066	-.016	.100	.069
E30	<b>.427</b>	<b>.306</b>	.044	<b>.457</b>	.207	.076	.093	.203	-.046	<b>.303</b>	.177	.117	.099
E31	.059	<b>.379</b>	<b>.306</b>	<b>.300</b>	.166	.259	.110	.168	.123	<b>.311</b>	.167	.049	.061
F32	-.036	.290	-.250	.046	.062	.267	<b>.488</b>	.176	.165	-.275	<b>.327</b>	.041	-.096
F33	.084	.286	-.095	<b>.406</b>	-.095	<b>.383</b>	.252	.130	.117	-.067	.280	-.198	.072
F34	.114	.072	.016	.177	.193	.286	<b>.508</b>	-.131	<b>.375</b>	<b>.301</b>	.143	.103	-.011
F35	<b>.473</b>	<b>.313</b>	-.069	.132	.049	.120	.269	.049	.099	-.015	.132	.174	<b>.324</b>
F36	<b>.421</b>	.182	.114	<b>.480</b>	.079	.074	<b>.378</b>	.085	.001	.253	.090	-.041	.006
F37	.230	<b>.315</b>	.083	<b>.358</b>	.166	.050	<b>.373</b>	.159	.128	<b>.324</b>	-.030	.077	-.119
F38	<b>.647</b>	.285	.120	.145	.121	.163	.287	.034	-.098	.060	-.039	.038	-.060
F39	<b>.855</b>	.015	.065	.061	.002	.043	.011	.074	.003	.041	-.010	-.035	.035
F40	<b>.838</b>	.027	.061	.060	.093	.035	-.072	.056	.072	-.063	.005	.108	-.070
F41	<b>.811</b>	.060	.068	.060	.118	.068	.053	.030	.137	.034	.083	-.005	.045
G42	.072	.032	.057	.043	.165	<b>.843</b>	.126	-.016	-.123	-.032	.026	.019	-.061
G43	.158	.141	.059	.087	.073	<b>.827</b>	.109	.037	.128	.074	.057	-.038	.085
G44	.041	.119	.069	.026	.086	<b>.867</b>	-.021	.115	.091	-.091	.004	.005	.101
G45	.108	.193	.127	.144	.000	.158	.194	.253	<b>.625</b>	-.094	.287	.159	-.181
G46	-.016	<b>.475</b>	<b>.371</b>	.153	-.194	.033	.125	.062	-.008	-.132	.010	.061	.125
G47	.287	.011	.015	<b>.431</b>	.176	.254	-.084	-.053	.049	.203	<b>.512</b>	.229	-.061
H48	-.031	.022	.042	<b>.496</b>	.114	.286	.103	.033	<b>.490</b>	.058	-.221	.002	.206
I49	.236	.111	-.003	-.164	<b>.765</b>	.195	.040	.023	.130	.095	-.076	-.090	-.089
I50	.110	.142	.158	.209	<b>.814</b>	.061	.070	.023	.082	.044	.145	-.019	.035
I51	.030	.092	.141	<b>.307</b>	<b>.771</b>	.115	.090	.050	.048	-.022	.038	-.017	.084
J52	<b>.375</b>	.124	.106	.199	.258	.194	<b>.341</b>	<b>.313</b>	-.066	.235	.038	.199	-.062

## 4 DISCUSSIONS

Results on content validity answered the question that the test items covered a representative sample of areas for motor, motor visual coordination and integration skills discussed in the scientific literature that should be assessed for Saudi preschoolers. Good face validity was confirmed by two international expert scholars, five clinicians and 25 senior student clinicians indicating the test items are clear, suitable and easy to use.

The factor structure of the test evaluation showed that items load most on the theorized scales indicating construct validity (Hefford et.al. 2011). A result of construct validity provides evidence of empirical and theoretical support for the interpretation of the constructs. Such lines of evidence include statistical analyses of the internal structure of the test including the relationships between responses to different test items.

## 5 CONCLUSIONS

The findings showed that the designed test was a valid and reliable instrument for measuring Saudi pediatric occupational functions in the preschool context. It is an easy to use test and contains the most significant occupational therapy related behaviors that are involved in daily activities and child's ability to interact with environment to learn and grow. The test underlying comprehensive framework provides a foundation for a user-friendly instrument for measuring Saudi child motor and visual-motor integration. A four-factor structure of occupational functions was identified. The reliability and construct validity of this test was proved. The next step for validating the test is to use Rasch model analysis to test the specificity and sensitivity of the test. A clinical sample needs to be tested as part of the statistical standardization framework which is part of the second phase of this research project.

## REFERENCE LIST

- Benson J, Clark F. (1982). A guide for Instrument development and validation. *Am J Occup Ther* 36: 789-800. doi:10.5014/ajot.36.12.789
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334.
- DeThorne, L. S., Petrill, S. A., Hart, S. A., Channell, R. W., Campbell, R. J., Deater-Deckard, K., Thompson, L. A., & Vandenberg, D. J. (2008). Genetic effects on children's conversational language use. *Journal of Speech, Language, and Hearing Research*, 51, 423–435.
- Friederici, A.D. (2006). The Neural Basis of Language Development and Its Impairment. *Neuron*, 52 (6) 21, 941–952. <http://dx.doi.org/10.1016/j>
- IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.
- Microsoft Office Professional Plus. (2010). Microsoft Excel Ink.
- O'Brien K. (2007). Factor analysis: An overview in the field of measurement. *Physiother. Can.*;59:142–155. doi: 10.3138/ptc.59.2.142.
- Nunnally, J., & Bernstein, I. (1994). *Psychometric theory*. New York: McGraw-Hill.
- Pérez-Arcea, P. (1999). The Influence of Culture on Cognition *Archives of Clinical Neuropsychology Review*. 14 (7): 581–592. [http://dx.doi.org/10.1016/S0887-6177\(99\)00007-4](http://dx.doi.org/10.1016/S0887-6177(99)00007-4).
- Pett, M.A., Lackey N.R., Sullivan J.J. (2003). *Making Sense of Factor Analysis: The Use of Factor Analysis for Instrument Development in Health Care Research*. Sage; Thousand Oaks, CA.
- Raubenheimer, J. E. (2004). An item selection procedure to maximize scale reliability and validity. *South African Journal of Industrial Psychology*, 30(4), 59–64.
- Resnick, L.B., Levine, J.M., Teasley, S.D. (Eds.). (1991). *Socially shared cognition*, American Psychological Association, Washington, DC.
- Spiliotopoulou G. (2009). Reliability reconsidered: Cronbach's alpha and pediatric assessment in occupational therapy. *Aust Occup Ther J.*, 56(3):150-5. doi: 10.1111/j.1440-1630.2009.00785.
- Streiner, D. L., & Norman, G. R. (1995). *Health measurement scales: A practical guide to their development and use*. Oxford, England: Oxford University Press.
- Van Deusen J, Shalik L, Harlowe D. (1990). Construct validation of an acute care occupational therapy cerebral vascular accident assessment tool. *Can J Occup Ther.* 57(3):155-9.
- Vygotsky L.S. (1978). *Mind in society*, Harvard University Press, Cambridge, MA.
- <https://www.aota.org/About-Occupational-Therapy.aspx>