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Construction and Validation of The Leiter International Performance Scale Software For 3 To 6 Year Old Children

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ABSTRACT

The present study was conducted with the aim of developing and validating the Leiter International Performance Scale software. The research method was psychometrics. Therefore, to validate the test after the software development, 200 children were selected from among all 3-6 year old children in the City of Isfahan, Iran, who attended kindergartens and pre-school centers, using the stratified random sampling. To investigate the construct validity of the scale, the Vineland Social Maturity Scale, and to study the concurrent validity, the Stanford–Binet Intelligence Scale were utilized. The test-retest reliability coefficients of the total score of the Leiter International Performance Scale software for 2 year and 1 month old to 4 year and 5 month children was .71 ($p \leq .001$). In addition, the reliability coefficient of the total score of the Leiter International Performance Scale Software for 4 year and 6 month to 6 year and 9 month old children was .82 ($p \leq .001$). Furthermore, Cronbach's alpha for 2 year and 1 month to 4 year and 5 month old children was .75 and for 4 year and 6 month to 6 year and 9 month old children, the reliability coefficient was .83. The correlation coefficient of the Leiter International Performance Scale software with the Vineland Social Maturity Scale was positive and significant ($r = .61$). The correlation coefficient between the Pre-school-Tehran-Stanford-Binet Intelligence-fifth edition and the Leiter International Performance Scale software was, as the evidence for concurrent validity, equal to $r = .34$ in the verbal subscale, and equal to $r = .75$ in the non-verbal subscale. The results of the present study indicated that the Leiter International Performance Scale software can be considered as a valid and reliable instrument for measuring children's intelligence.

Key words: Leiter International Performance Scale software; preschool children; non-verbal intelligence

1. INTRODUCTION

The concept of prevention and early assessment and intervention has been among the concepts which has been of interest to specialists and clinicians in recent years. Various equivalents for this concept have been proposed in the literature, including prevention and primary intervention, timely, early, initial, and compensatory intervention. In fact, early intervention means to agree on a systematic

and continuous efforts to provide timely help not only to children under 6 years who are weak and vulnerable, in terms of growth, but also their families (Alliston & Education, 2007; Stes et al., 2015). Over the past decades, the significance of early intervention has been emphasized and early interventions are developed. Allen (2011) asserts that early intervention for children is a new and developing concept. In a short time, within a decade, early interventions has turned from emerging services with a limited performance range to a widespread theory with intensive research and a sucessful performance (Mitchell & Brown, 2013).

Dadsetan (2013) summarizes the objectives of prevention and early intervention as, (1) increasing intelligence and help flourishing the potentials of the child, (2) helping children not only in physical development but also cognitive, language and psychosocial development; (3) prevention of disorder development or the occurrence of secondary defects; (4) family stress reduction; (5) reducing the dependence on others and adjusting to social settings; (6) reducing the need for special education services in school aged children ; and (7) considerable savings in health and education costs. Emphasizing on early interventions and prevention, rather than treatment, is socially and economically more effective. In general, from a psychological and sociological standpoint, prevention programs and early intervention greatly benefit children, families and society; moreover, using early intervention and prevention programs is more economical.

Intelligence has been one of the most important constructs which has frequently been fererred to in prevention and early intervention to identify the educational and psychological needs of the children. On the one hand, intelligence is associated with academic achievement and on the other, with executive functions and neurological abilities (Rohde & Thompson, 2007; Arffa, 2007; Barbey et al., 2012; Brydges, et al., 2012; Kesler et al., 2013; Clark eet al., 2012). The issue of the inelligence construct has been differently raised in psychology and education; however, it can be used to differentiate normal children from children with mental disabilities, slow-paced, gifted and talented and those with learning disabilities (Lotfi Kashani, 2006). In order to develop appropriate programs, prevention and early intervention for different groups of children, the IQ profile of the child needs to be provided by administering tests; moreover, an assessment-based plan can be developed using a quantitative-based approach (Afrooz & Kamkari, 2009). Therefore, intelligence measurement is considered as one of the most important sources of information in identifying the special needs of children.

By the help of information obtained from the standardized intelligence tests, experts in educational settings might be able to carry out a thorough assessment, as an early prevention strategy, to identify at risk children. However, researchers have always directed many criticisms against intelligent tests. Intelligence tests has been criticized on the grounds that rather than assessing the learning capacity, these tests assess the end result of the past learning of an individual and underestimate the learning ability of people belonging to lower socio-economic classes, people with learning difficulties and people with little opportunities to acquire knowledge and skills requisite for success in the test (Hallahan et al., 2004). As a result, these tests would not be able to distinguish naturally developing children from children with special needs.

These criticisms led the experts in the field of intelligence assessment to design performance tests. The term performance applies to tests that require minimal understanding and use of language. These

tests are also called nonverbal tests (Flanagan & Harrison, 2012). Nonverbal tests can be used, irrespective of cultural and educational differences, to evaluate basic mental process, such as reasoning and understanding relations. The intelligence of dumb, hearing impaired and deaf children as well as children from different cultures can be unbiasedly measured by these tests. Raven's progressive matrices, Cattell's Culture Fair Intelligence Test and Leiter International Performance Scale are among these tests.

Leiter International Performance Scale was designed by Russell Graydon Leiter for the age range of 2-18. The purpose of this test is measuring the G factor or the general intelligence by visual-motor activities. This is a culture free test which has no verbal instruction; therefore, it can measure the intelligence of different age, cultural and economic groups as well as individuals with speech and language impairments, deaf children and other children with special needs (Hooper & Bell, 2006). This test includes 54 items which are scaled in line with the Stanford-Binet test. There are four items for each age, ranging from 2 to 10 years of age. Therefore, each item represents the mental age of 3 months. Moreover, there are two items for each age rage of 11 to 18 where each item represents the mental age of 6 months. The test items are ordered and arranged according to their degree of difficulty. Though all items are performance based, the items have various content, including detecting similar colors, sorting parts, color and shape matching, queueing circles, facial expressions' detection, detecting age differences, spatial relationships, identifying footprints, identifying similar aspects, chains and classifying animals according to their habitats. The items designed for younger ages are simple. This simiplicity provides the learning chance for the child and establishing a good relationship with him. Therefore, the whole test is considered as a game for a child. Moreover, problem solving strategies and ensory and motor functions of the child can be observed during test administration (Hooper et al., 2000). To administer the Leiter test, the test administrator calculates the base age (the age whose all items will be responded by the child) and then the test continues until the child wrongly answers the items of three sub-scales. In the end, the base age of the child will be added up to all points earned beyond the base age. The obtained number displays the child's performance intelligence (Stinnett, 2001). This measure, which is used both in the coutry and abroad, is highly valid and reliable. In more than half of the performance intelligence subscales of this measure, the estimated reliability was .8 (Hooper & Bell, 2006). In addition to the approved construct validity of this measure, the evidence indicate a high correlation of this measure with Kaufman Brief Intelligence Test, second edition (KBIT-2), Mullen Scales of Early Learning (MSEL), Stanford-Binet intelligence scale and Wechsler Intelligence Scale for Children (WISC–IV). This correlation is the indication of criterion validity of this measure (Scattone et al., 2012; Caudle, et al., 2012; Atkinson et al., 1992; Alper, 1958).

Moreover, the development of computer sciences and their interaction with psychology on the one hand, and the development of research methodology in psychology on the other hand, points to the importance of the fact that the computer examination of many processes and brain functions will lead to more accurate results (Sakong, 2007). Due to the advantages of using computers, including being less time-consuming, better control of the influential variables, reducing human errors in estimating the results and increasing the accuracy and the precision of data, computer tests has replaced traditional tests in measuring neuropsychological processes. In other words, besides considering the importance of classic tools, the researchers keep pace with the abrupt changes in technology and

attempt to transform traditional tests to computer tests. Obviously, design and development of the computer versions of psychological tests, in a standard form, which is also consistent with and tailored to Iranian culture is inevitable. There is a great need to standard and appropriate psychometric tests in Iran since IQ tests for children are widely used, especially in clinics, health centers, kindergartens and schools. In order to meet this need and with regard to the benefits mentioned for computerized tests and since software version of the Leiter International Performance Scale does not exist in Iran, the purpose of the present study was the development of the software version of this test (child form) for children from 3 to 6. This software is colorful and varied; moreover, psychologists and experts can evaluate the nonverbal intelligence of preschool children through simple games. Given the above points, the present study also seeks to validate the software version of the Leiter International Performance Scale for 3 to 6 year old children in Isfahan, Iran.

2. METHODOLOGY

Given that the objective of the present study is construction and validation of the Leiter International Performance Scale software for 3 to 6 year old children in Isfahan, Iran, the research design is psychometric. The population includes all 3 to 6 year old children of Isfahan in 2015 who were training in preschool centers and kindergartens. Samples were selected by the stratified random sampling. In so doing, among different zones in Isfahan city, two zones were selected and then among the kindergarten and pre-school centers, 10 centers were selected for this study. The minimum sample size for descriptive studies is 100 and for correlational studies is 50 (Delavar, 2000). The sample size of 100 or more is desirable for normalizing tests (Saraee, 1997).

The inclusion criteria for the present study were, (1) children of kindergartens and preschools, both boys and girls, (2) visual and auditory health, (3) lack of emotional-behavioral problems in children and (4) lack of childhood psychiatric disorders. Moreover, the exclusion criteria included, (1) unwillingness to participate and (2) incomplete filling of the questionnaires. The criteria for inclusion and exclusion were set and evaluated by a master of psychology and education of children with special needs by referring to the medical records of children.

3. INSTRUMENT

Researcher developed software of the Leiter International Performance Scale: the Leiter International Performance Scale, developed by Russell Graydon Leiter, is a culture free and nonverbal measure for the assessment of intelligence of 2-18 age range children. It can be administered individually, practically and without time limitation. Due to its appropriate content and little verbal instruction, this scale is a useful assessment and diagnostic instrument for professionals and researchers. Flash software, which is an animation software, is used for software design. In so doing, photos were taken from the Leiter test boxes and the figures needed for the software were designed according to photos. After the figures' design stage, the original form of the program, which should be similar to the original Leiter test, was designed and then, all the figures were placed in the original form of the software, afterwards, programming and the design of the original program started.

Identical to the Leiter rules, the software should be designed so that the onset age is calculated as two years before the chronological age (considering the rule and programming requisites, the age of test onset assigned as two years before the chronological age). To put it differently, if the test taker is 6 years old, he should start from age 4; therefore, the program intelligently starts the test from two years before the chronological age. Moreover, the software receives the date of birth of the test taker and automatically calculates the age of the individual at the time of testing in months. To start the test, two trial questions will be presented to test takers to get familiar with the test and its administration; afterwards, the main test starts. According to Leiter rules, each correct answer will receive one point which is a criterion for the calculation of the mental age of each item. This point equals three months of mental age. If the test taker wrongly answers four items of an age in a series, the software will stop and the exam ends. At the end of the test, the Leiter software intelligently perform all computations, such as chronological age, mental age, total score, the number of right and wrong answers and IQ and displays them in a protocol. One of the advantages of this software is that it reports, at the end, which items were answered correct and which incorrect by each test taker. Using the original scales, figures and approaches, the researcher designed and developed the software of Leiter International Performance Scale. Photos of the software environment are presented in Appendix (1).

New version of Preschool-Tehran- Stanford- Binet Intelligence Scales (TSB-5): this test is based on the Stanford-Binet Intelligence Test-fifth edition which was developed by Roid in 2003 and standardized by Afrooz and Kamkari in 2006. This version can measure the IQ of the age range of 2 to 85 years (Farid et al., 2014) and includes two domains of verbal and nonverbal and each domain includes five subtests, namely fluid reasoning, knowledge, quantitative reasoning, visospacial processing and working memory. The mean and the standard deviation of each subtest are 10 and 3 respectively. Moreover, this test can present 8 IQ types including fluid reasoning, knowledge, quantitative reasoning IQ, visospatial processing IQ, working memory IQ, verbal IQ, non-verbal IQ and total IQ. Furthermore, it is capable of differentiating scores which are sensitive to change, estimating combined scores related to reading disabilities and calculating impairment (Coolican et al., 2008). The validity coefficients of the ten sub-scales of this intelligence scale were between .84 and .89. which is the indicator of the high validity of the sub-scales and the combined scores (Roid, 2007).

Vineland Social Maturity Scale: this scale is one of the developmental scales which was developed by Edgar A. Doll in 1935 and totally revised in 1965. This scale is one of the scales which measure the developmental abilities, responsibility and the ability to meet the performance needs. This scale covers the age range of birth to above 25 and includes 117 items divided into one year groups. The information necessary for each item will be collected by interviewing test taker or parents. This scale focuses on the individual's abilities in his daily life. The items are further divided into 8 sub-scales of general self-help, self-help eating, self-help dressing, self-direction, occupation, locomotion and socialization. An individual's Social Age (SA) and Social Quotient (SQ) will be estimated based on his score (Lerer, 2008). Vineland Social Maturity Scale has been normalized by Baraheni (2004) in Iran. The results of this normalization study, using test-retest reliability estimates and other assessments, indicates that the scale is desirable and acceptable (test-retest reliability of .92, with a sample of 123 persons).

4. PROCEDURE

To carry out the present study, first, permissions were obtained for data collection in kindergartens and preschools. Then the participants were randomly selected. Afterwards, the children were evaluated using Leiter International Performance Scale software, Stanford-Binet intelligence scale and Vineland Social Maturity Scale.

5. DATA ANALYSIS

To examine the validity of the newly developed software, descriptive and inferential statistics were used. Test-retest was used to estimate the reliability of the scale and the internal consistency was estimated by Cronbach's alpha. Construct validity and convergent validity (correlation of the Leiter test with Stanford-Binet intelligence scale and Vineland Social Maturity Scale) were the indices of the validity of the scale. To prepare the norm tables, mean, variance, standard deviation and standard scores were obrained.

6. FINDINGS

The results of the data analysis, related to demographic variables are presented. These include father's education, mother's education, father's occupation, and the occupation of mother (Table 1).

Table 1. Demographic information of sample

Variable	Levels	No.	Percent	Cumulative Percentage
Father Education	Illiterate	13	5.41	5.41
	Below Diploma	18	7.50	12.91
	Diploma	59	24.58	37.49
	Associate Degree	39	16.25	53.74
	Bachelor	91	37.91	91.65
	Master	11	4.59	96.23
	PhD	9	3.76	100
Mother Education	Illiterate	16	6.66	6.66
	Below Diploma	18	7.50	14.16
	Diploma	53	22.08	36.24
	Associate degree	29	12.08	48.32
	Bachelor	98	40.84	89.16
	Master	16	6.67	95.82
	PhD	10	4.17	100
Father Occupation	Self Employed	143	59.58	59.58

	Government Job	79	32.91	92.49
	Died	11	4.58	97.07
	Others	7	2.93	100
Mother Occupation	House Wife	157	65.41	65.41
	Government Job	38	15.83	81.24
	Self Employed	40	16.66	97.90
	Others	5	2.10	100

As it can be seen from Table (1), the most frequent level of education for fathers was bachelor, with 90 persons (37.91%) and the least frequent was PhD, with 9 persons (3.76%). Similar to fathers, the most frequent level of education for mothers was bachelor, with 98 persons (40.84%) and the least frequent was PhD, with 10 persons (4.17%). The most frequent fathers' occupation was self-employment, with 143 persons (59.58%) and the least was other occupations, with 7 persons (2.93%). Moreover, mothers were most frequently house wives, with 157 persons (65.41%) and the least frequent mothers' occupation was others, with 5 persons (2.10%).

6.1. Test-retest reliability coefficient

To estimate reliability, test-retest method (two weeks after the first administration) was used. The results are given below (Table 2).

Table 2. Test-retest reliability coefficient for the total score of Leiter International Performance Scale Software for 2 year and 1 month to 4 year and 5 month children

Leiter International Performance Scale Software	Correlation Coeffcient	Significance Level
	.71	.0001

As indicated in Table (2), the estimated reliability coefficient for the total score of Leiter International Performance Scale software for 2 year and 1 month to 4 year and 5 month children is significant at .001 level.

Table 3. Test-retest reliability coefficient for the total score of Leiter International Performance Scale Software for 4 year and 6 month to 6 year and 9 month children

Leiter International Performance Scale Software	Correlation Coeffcient	Significance Level
	.82	.0001

Table (3) presents the reliability coefficient for the total score of Leiter International Performance Scale software for 4 year and 6 month to 6 year and 9 month children. The coefficient was .82, which is significant at .0001 level.

6.2. Cronbach's alpha reliability coefficients

To estimate the internal consistency, Cronbach's alpha was used. The results are presented below (Table 4).

Table 4. Cronbach's alpha reliability coefficients for children

Age	Cronbach's alpha
2 years and 1 month to 4 years and 5 months	.75
4 years and six months to 6 years and 9 months	.83

As shown in Table (4), the Cronbach's alpha reliability coefficients for 2 year and 1 month to 4 year and 5 month children is .75 and it is .83 for 4 year and 6 month to 6 year and 9 month children.

6.3. Construct validity

The construct validity of Leiter International Performance Scale software was estimated using convergent validity. The convergent validity of this scale was evaluated by administering the Vineland scale. The correlation coefficient results are presented in Table (5).

Convergent validity of the Leiter International Performance Scale software with Vineland scale is significant at the .0001 level.

6.4. Concurrent validity

Binet intelligent test was used to evaluate the concurrent validity of the Leiter International Performance Scale software. The correlation coefficient results are reported in Table (6).

Table 6. Correlation coefficients between Binet intelligence scale for preschoolers and Leiter International Performance Scale Software as an evidence for concurrent validity

Binet Intelligence Test	Verbal Score	Performance Score	Total Score
Leiter Total Score	.342	.754	.689

As it can be seen, the correlation coeeficient between Leiter test and Binet intelligent test is .689 (Table 6).

6.5. Standard scores and percentile ranks

The raw scores of the Leiter International Performance Scale software were first converted to Z scores (Table 7) and then to standard score. The percentile ranks are also listed in the same table.

		Vineland scale
Leiter International Performance Scale Software	Correlation Coefficient	.61
	Significance	.0001

Table 7. Converting raw score to standard score and percentile rank

Raw score	Standard Score	Percentile Rank
8	27.26	2
9	28.61	2.5
12	32.67	3.5
13	34.03	6
14	35.38	7.5
15	36.74	9.5
16	38.09	13.1
17	39.45	18.1
18	40.80	21.1
19	42.16	23.6
20	43.51	29.1
21	44.87	34.2
22	46.22	38.2
23	47.58	42.2
24	48.93	49.7
25	50.29	55.3
26	51.64	60.3
27	53	65.8
28	54.35	69.3
29	55.70	75.4
30	57.06	78.9
31	58.41	80.9
32	59.77	82.9
33	61.12	87.4
34	62.48	88.4
35	63.83	90.5
36	65.19	95
37	66.54	95.5
38	67.90	97.5
39	69.25	98
42	73.32	99
43	74.67	99.5
44	76.02	100

Table (8) presents the the range of the percentile rank of the raw scores of the Leiter International Performance Scale software.

Table 8. Raw scores equal to percentile ranks

Percentile Rank	Range	Leiter Score

Above the expected level	>83	32-44
At the expected level	21-83	18-32
Borderline	3-21	10-18
Far below the expected level	<3	Below 10

And finally, Kolmogorov-Smirnov test presents the normality assumption of the Leiter International Performance Scale Software (Table 9). As it can be seen, the scores obtained from this software are normally distributed.

Table 9. Kolmogorov-Smirnov test for normality assumption of Leiter International Performance Scale Software

Leiter International Performance Scale Software	Kolmogorov-Smirnov (Z)	Significance Level
	.41	.2

7. DISCUSSION AND CONCLUSION

The present study aimed at constructing and validating Leiter International Performance Scale software. The significance of the present study is that the operationalization of the concepts and constructs of nonverbal intelligence is examined by investigating and confirming the psychometric properties of Leiter International Performance Scale software. From now on, the interested researchers can use Leiter International Performance Scale software in different groups to assess their performance and nonverbal intelligence. The other significance of the study lies in the appropriacy and the acceptability of the features of Leiter International Performance Scale software. With the help of interesting and performance based items, a deep and comprehensive understanding of individual's attitude towards the disabled can be evaluate.

Reiteration or reliability of the scores of an assessment instrument has always been one of the most essential features of the instrument which makes its applicable to clinical and research settings. The reliability of a measurement instrument mainly refers to the stability and accuracy of the results. To evaluate the validity of the Leiter International Performance Scale software, test-retest reliability, with a two-week interval, and Cronbach's alpha were estimated. The findings of the estimations are in line with Arthur (1952), Shah and Holmes (1985), Tsatsanis et al. (2003) and Scattone et al. (2012). The Cronbach's alpha coefficient, reported in findings, is acceptable and appropriate. As stated in the literature, the coefficient of .7, is an acceptable coefficient for a test (Werner et al., 2013). On the other hand, the purpose of using test-retest to estimate validity is checking not only the main properties of the validity of the instrument but also the internal consistency of the instrument which can be obtained by two administrations and Cronbach's alpha (Shahrivari et al., 2010). Based on the obtained results, it can be concluded that the overall internal consistency of the instrument is desirable.

Construct validity implies the accuracy of the test or a scale in measuring the theoretical construct or the desired properties. This type of validity is an empirical based validity which validates a measurement instrument by observable evidence. Construct validity compares the findings with the theoretical framework of the study. To ensure the construct validity of a measurement instrument, the variances should be accounted for by the theoretical factor. In other words, the measurement instrument should measure the major constructs. Comparing the results of a scale with another scale, which is supposed to measure the same intended construct, is one way of assuring construct validity. If the correlation between the two scales is high, we may assume that both are measuring the same construct; therefore, the intended scale is valid in measuring the desired construct or its related properties.

This study assumed that there is a relationship among the developmental milestones. For instance, some researchers have indicated that nonverbal intelligence and social development are correlated (Riggio, 2005; Hall et al., 2005; Brüne et al., 2009). Therefore, convergent validity was used to check for the construct validity of the Leiter International Performance Scale software. In so doing, the Vineland scale was utilized to estimate the convergent validity of the Leiter International Performance Scale software. The convergent validity analysis of these two scales indicated a significant and positive correlation.

Mecca, Orsati and de Macedo (2014) administered the Leiter International Performance Scale and found a high correlation between this scale and social skills. Phillips et al. (2014) and Balboni et al. (2015) found that the nonverbal intelligence measured by the Leiter International Performance Scale is correlated with social skills of children. The similarity of the findings of the present study with other studies might be due to the detailed evaluation and correct interpretation of data, the researchers' effort to design and develop an appropriate and accurate software and meticulous preparation of figures. Any problem in finding the proper replacements for the items will negatively influence the results and weakens the psychometric properties of the instrument. Taken together, all these factors make the Leiter International Performance Scale software a scale which can measure nonverbal intelligence of children.

Criterion validity refers to the correlation between the scores obtained from a scale and a criterion. Correlation is sometimes estimated to predict future (predictive validity). To put it differently, the criterion will be administered with a time interval, after the administration of the intended scale, which called predictive validity. If there is no time interval between the administrations of the two measures, the validity is called concurrent validity. Among the available measures of IQ, Preschool-Tehran-Stanford-Binet Intelligence-fifth edition seems to be acceptable. This test is divided into two domains, namely verbal and non-verbal. These domains are more important in educational settings and provide the combined scores for the identification of learning disabilities. Due to the potentials of Preschool-Tehran-Stanford-Binet Intelligence-fifth edition, it was administered along with the Leiter International Performance Scale software. A significant and positive correlation, as an indication of concurrent validity, was observed between Preschool-Tehran-Stanford-Binet Intelligence-fifth edition and the Leiter International Performance Scale software which indicates the acceptable concurrent validity of the Leiter International Performance Scale software.

These findings can be explained referring to the previous studies. Roid, Nellis and McLellan (2003) concurrently administered the Leiter International Performance Scale and the Stanford–Binet Intelligence Scale. The results indicated a significant and positive correlation between these two scales. Similar findings were reported by other researchers (e.g.Tsatsanis et al., 2003; Portoghese, et al., 2010; Grindle et al., 2012; Grondhuis & Mulick, 2013).

Moreover, the norm will be obtained from standard scores and percentile ranks. Normal distribution of standard scores facilitates the comparison of two test takers. The norms of the standard scores are standard deviation, the standard deviation of the mean scores and the deviation of the predetermined

standards. In general, norms and profiles facilitates the comparison of child's levels of achievement and their success rate and the comparison of children with each other. Percentile rank specifies the relative position of an individual relative to those who have lower scores. Each raw score has a percentile rank. Therefore, each raw score has a norm equivalent which is the percentile rank of that score. Taken together, the standard scores and percentile ranks of the Leiter International Performance Scale software can be used for comparing students.

Although the study has reached its aim, there were some unavoidable limitations including: (1) the Leiter International Performance Scale software was normalized only for children of age 3 to 6. Therefore, the standatrd scores and the percentile ranks are just applicable to these ages; (2) The Leiter International Performance Scale software was normalized only for children of age 3 to 6 in Isfahan. Therefore, the standatrd scores and the percentile ranks are appropriate for Isfahan; (3) this study focused soley on the Leiter International Performance Scale software to identify the children with developmental delay. Since the significance of the intervention, after the identification of the delay, is undeniable, future researchers are recommended to develop proper interventions based on the findings of this scale; (4) Concurrent validity is another limitation of the present study. Due to time limitations, concurrent validity was used in this study; however, it is recommended that the future researchers apply and estimate predictive validity; (5) retesting might not be desirable for some test takers. Some may not participate in the second administration; therefore, the sample size reduces; and (5) long and boring tests and questionnaires negatively influence participants and accordingly, test results.

It is recommended to normalize the Leiter International Performance Scale software for children above 6 in Iran. Moreover, the ministery of education is recommended to use this software along with the current test for primary school entrance to be able to compare the nonverbal cognitive characteristics of normal and developmentally delayed children. The results of the comparison might facilitate the development of early interventions. It is recommended that an intervention package be prepared, based on the Leiter International Performance Scale software, and implemented for children with developmental delays.

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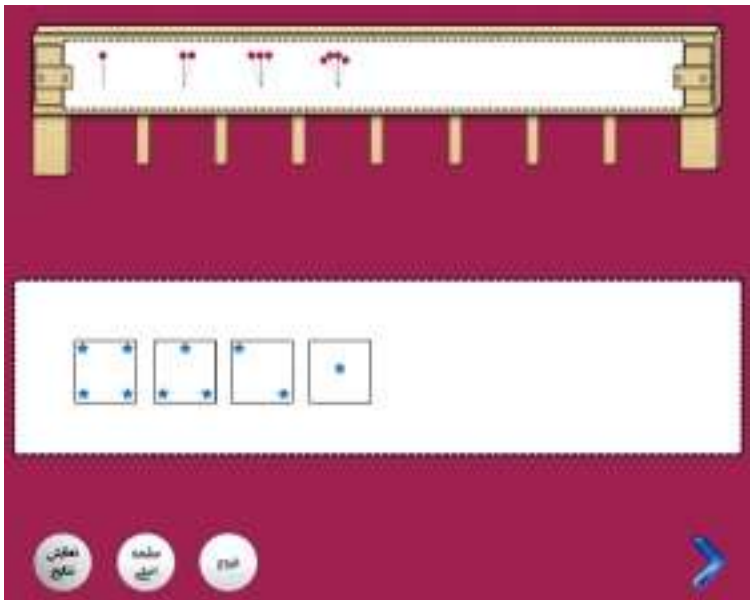
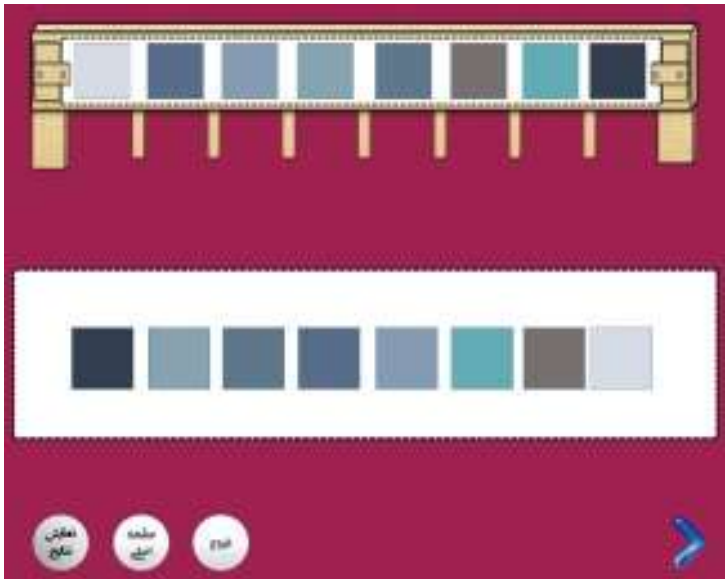
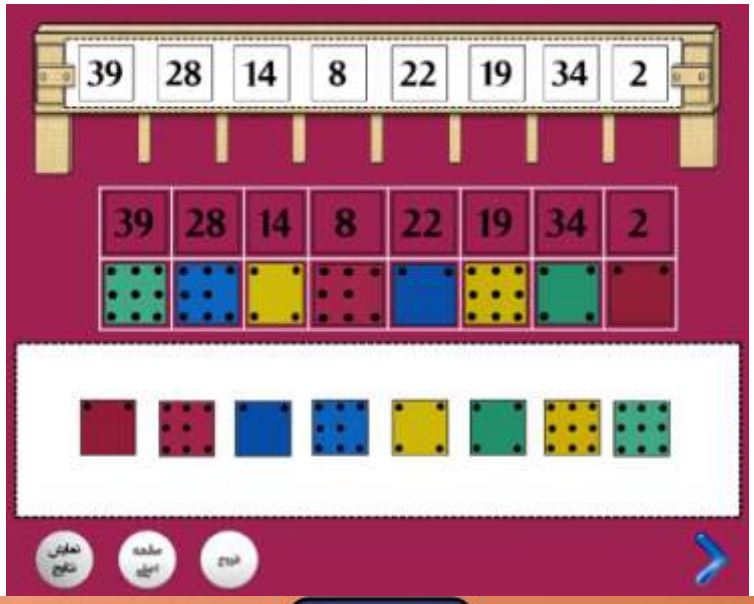
Appendix (A): Photos of the software environment



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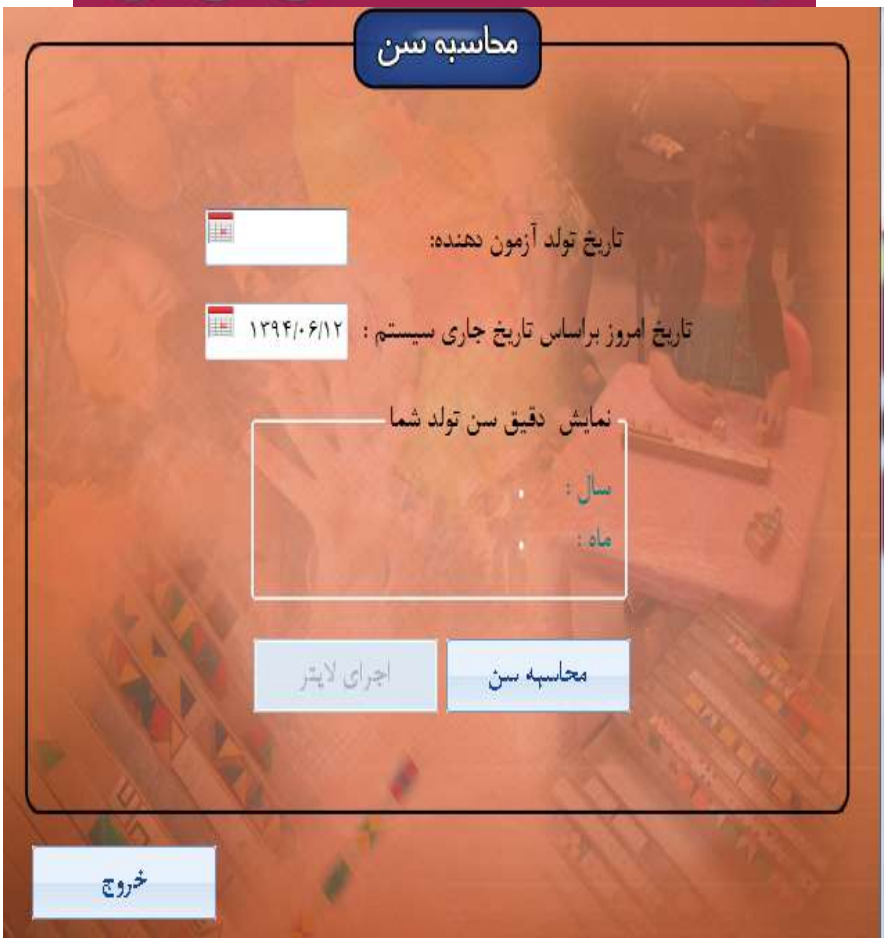
39 28 14 8 22 19 34 2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