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RESEARCH ARTICLE

The Diagnostic Inventory for Screening Children (DISC): Cross-cultural adaptation and psychometric evaluation of the test in Azerbaijan.

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Abstract

The current study aimed at carrying out the cross-cultural adaptation of Diagnostic Inventory for Screening Children (DISC) to the Azerbaijani language. The study was a response to the growing demand in the sphere of child development assessment dictated by the lack of proper assessment tools in this sphere in Azerbaijan. The cross-cultural adaptation and following validation of the Azerbaijani version of the DISC was conducted in the country. A total of 250 subjects from urban and rural areas of Azerbaijan were enrolled to the study. The current paper presents the methodology used by the author and the results of the cross-cultural study on adaptation of the DISC. According to the results of the study the DISC is applicable to children in Azerbaijan. It has satisfactory psychometric properties, but further research is required to evaluate these properties in a population study.

Introduction

Children develop throughout their lives and the development is a continuous process representing the combination of various closely interrelated domains interacting with and influencing each other. These include physical, cognitive and socio-emotional domains of the child development. To understand these domains and the related interlinkages the proper multifaceted assessment tools are acutely needed. The understanding of the domains and their interactions helps to identify and explain the manifestation of developmental problems at early ages. It has to be noted that the child development is also a process with a predictable sequence, however, every single child has an individual course of development. This individual course of development can be explained by biological/genetic, social and cultural factors that influence the development and make it individualized. Taking this into account child development assessment tools need to reflect social-cultural context of the child's community with the ultimate goal of understanding the social, emotional, cognitive and physical dimensions of child development and applying the proper prevention and intervention programs based on the results of the assessment. When applied timely the proper assessment tools allow early identification of developmental problems and help to prevent the secondary problems and complication of the situation by suggesting the relevant intervention programs for the child and its family. In addition to it, assessment tools help to monitor and measure the progress achieved throughout the implementation of intervention programs. This makes the assessment process and the availability of culture sensitive, age appropriate assessment tools inevitable part of child care services.

The child's development has to be assessed using reliable and valid standardized tools. However, these instruments are not available in all languages. The cases of inaccurate identification of children's developmental

problems are common in the institutions dealing with children in Azerbaijan. Less than half of these problems are identified before the child reaches school age, thus meaning that early intervention opportunities have been missed and the problems may have worsened. Even if there is an attempt to identify the problem the specialists dealing with the kids use tools which are not age-relevant, norm-referenced, adapted and standardized to Azerbaijani context. However, availability of standardized assessment could have helped to identify problems at early stages of development and implement adequate development programs with the purpose of prevention of secondary problems.

The Diagnostic Inventory for Screening Children(DISC; Amdur, Mainland, & Parker, 1999) is an individually-administered test for referred preschool children from birth to five years old who are suspected to have a developmental disability. The DISC was developed in Ontario to fill a clinical need for a measure more sensitive than screening instruments used in mass testing of non-referred children and less expensive and comprehensive than a full diagnostic assessment (Parker, Mainland, &Amdur, 1990). The DISC has good reliability (Darrah, Hodge, Magill-Evans, & Kembhavi, 2003; Drummond, Fleming, McDonald, & Kysela, 2005; Parker et al., 1990), but validity data are limited(Parker et al., 1990; Watson &Henington, 1998). Despite this relatively weak psychometric foundation of the DISC (Watson &Henington, 1998), it isused in various programs across Canada (Darrah etal., 2003; Drummond et al., 2005; Heidebrecht, 2006;Horner &Heidebrecht, 2004). Ideally, assessment should provide a clear link to intervention(Gilliam & Mayes, 2000), but standard measures, such as intelligence tests, often have too high a "floor" for this population and provide little information useful to intervention planning (Siegel-Causey &Allinder, 1998).The DISC was developed with facilitation of treatment planning as an important goal(Amdur et al., 1999).

The DISC provides a profile of scores in eight skill areas, each of which contains 27 items arranged by difficulty and distributed fairly evenly across the age range: Fine Motor, Gross Motor, Receptive Language, Expressive Language, Auditory Attention and Memory, Visual Attention and Memory, Self Help, and Social Skills. The items are scored by prompting the child and observing the child's response, although caretaker report may be accepted for Self Help, Social Skills, and for Expressive Language items below age two. DISC items were derived from a review of the developmental literature and from existing intelligence and developmental tests, standardized on 500 participants, and normed on an additional sample of571, with about 50 children at each of 11age ranges (Parker et al., 1990). The DISC is using a multi-method, multi-informant approach that takes advantage of both direct observation and report by informants who know the child well (Carter, Briggs-Gowan, & Davis, 2004).

The lack of instruments of this type in Azerbaijan limits researchers to two alternatives: they have to consider choosing the development of a new instrument or cross-cultural adaptation of an existing one. When looking at both alternatives we can conclude that developing a new assessment tool is a costly and time consuming process. Another disadvantage of a new instrument development is the fact that the data will be collected only in one country/culture and it will not be possible to compare the data with other parts of the world. While the second alternative, in comparison to the first, requires less time, less resources and the main advantage is the possibility to compare the data from other parts of the world. Therefore, the translation and cultural adaptation of instruments is an internationally recognized method (Gandek& Ware, 1998; Grassi-Oliveira, Stein, &Pezzi, 2006; Li, Wang, &Shen, 2003; Maneesriwongul&Dixon, 2004; van Widenfelt, et.al. 2005). The aim of the present study was to carry out the cross-cultural adaptation of the DISC to the Azerbaijani language and to test its reliability and validity.

Adaptation and translation of the DISC

In this section, the adaptation process of the DISC and the problems that arose in the process of cross-cultural tool adaptation are discussed.

Forward translation process

In order to assess children's development in Azerbaijan, the assessment tool needed to be subjected to translation and cross-culturaladaptation (Herdman, Fox-Rushby,&Badia, 1998; Streiner& Norman, 2003). The DISC was translated into Azerbaijani using the forward-and-back translation processes, using three translators, and tested using bilingual reviewers. Based on the recommendations of International Test Commission (2010), two initial translations were made independently by two translators (Azerbaijani fluent in the English language) with an experience in child development assessment tools translation. All options were reviewed during the review committee meetings in which translation choices and cross-cultural adaptations were made. The review committee consisted of two translators, two psychologists, social worker and research consultant, all fluent in both Azerbaijani and English. For the determination of conceptual and item equivalence, review committee specialists evaluated this version and compared it to the original. Attention was given to the meaning of the words in Azerbaijani and English languages in order to obtain similar effects on Azerbaijani children. An effort was made to identify possible difficulties in understanding the question book. As a result of this process certain items were modified and a new version was developed.

Pre-test

Twenty children from birth to 5 years old residing with their family, with no apparent physical or cognitive problems, where Azerbaijani was the first language spoken in the home, were tested using the adapted version of the DISC. These children were recruited from the author's social network. Based on the results of the pre-test a number of changes in specific items were also necessary to reflect differences in meaning between Azerbaijani and English versions of the DISC. Further modifications were made according to the comments made by the children and their parents in order to clarify the content of the question book. The parents and when applicable children individually suggested the substitution of a number of words and expressions as synonyms in order to facilitate comprehension of some items.

Back-translation process

In order to check the translation, the final version was then translated back into English by one fluent in English individual who were not previously involved in the study and did not see the original English version of the tool. To determine semantic equivalence, native English speaking educational specialist with no prior knowledge of the study compared the back-translated English version with the original English version of the DISC. The aim of this step was to achieve a "similar effect" on respondents who speak two languages (English and Azerbaijani). Based on the comments and feedback of the reviewer the proper changes and revisions were further made to the instrument and these two versions, original English and revised back-translated English versions proved nearly identical.

Difficulties in the process of adaptation

During the adaptation process the review committee had several meetings to address differences between the Azerbaijani and English languages and cultures. Mainly items of language scales, attention and memory scales, as well as social and self-help skills were modified when necessary. For example, expressive language scale of the original English version of the DISC has an item that checks children's understanding of number concept and ability to apply grammatical structure (single and plural forms are used). However, in Azerbaijani language there is a different rule when using single and plural forms, when number is used the following word does not get any suffix of plural form, for example, if in English language we say "1 book and 2 books", in Azerbaijani language we say "1 book and 2 book". The suffix showing whether the item is single or plural is used without number. So, for the purposes of adaptation the review committee decided to remove the number and use only words to check whether children can understand single and plural forms and apply the necessary suffix. However, most of the tested children could not perform this task and after having the results of the population study this item will be moved toward the older age section of the test or further modified. The items in audio and visual attention and memory scales were revised and changed as well. Certain items that were using words starting with the same letter, or the combination of pictures and words were changed due to differences between the Azerbaijani and the English languages. The words that start with the same letter in the English do not start with the same letter in the Azerbaijani or the difficulty level is different, for example the word "truck" is a simple word to pronounce in the English, once it gets translated into the Azerbaijani we get a combination of two words that do not relate to the age this item is originally developed for. During the meetings of the specialists the proper changes were made to replace words and pictures accordingly keeping the level of difficulty. Some slight changes were made to the picture booklet used during the administration of the test. For example, there was an item that requires a child to show the object based on the explanation of the action that the object is performing at the picture. In the picture booklet there is a page with the pictures of a flag, finger and balloon, etc., and the item requires the child to show the picture that shows balancing action (finger and balloon). When translated into Azerbaijani the word balancing is a difficult word to use by the certain age and therefore the instruction for this item was changed accordingly, the word "balancing" was replaced by theword "waving" (flag). Generally speaking, slight changes were made to the all scales excepting fine and gross motor scales. Mainly language scales, attention and memory scales as well as self-help and social scales were subjected to changes and adaptations. The original version and translated versions of the fine motor and gross motor scales were almost identical.

Study sample

The study included children who were living at home, born no more than one month premature, with no apparent behavior or emotional problems, and where Azerbaijani was the first language spoken in the home. Initially, it was planned to have random sampling and with this purpose the official letters were sent to the respective structures to get access to the list of all the children from birth to five years old residing in Baku city. Once the list of children were ready 250 children were selected from the list for the study purposes. Additional 50 children were also randomly selected from the list in case of refusal from the actual sample. The author contacted families via phone to explain the study purposes and get permission from the parents or caregivers for their children to participate in the study. Just a few of them allowed the administration to take place in their home environment, the remaining families agreed to bring their child to the health institutions ("poliklinika") or when applicable to the kindergarten to allow the author to administer the DISC. Almost 50 families either refused to participate in the study or it was not possible to contact them. Therefore, the sample was biased due to voluntary participation. However,

the method of selection of the study participants was based on ethical issues, the researchers respected the family's decision not to participate and they were not contacted again. Families that agreed to participate received and signed a consent letter before the administration of the DISC with their child.

Data collection

It was planned to conduct the DISC in a quiet, well-lit room that is familiar to the child. However, in some cases (when the administration of the test took place at the health institution or kindergarten) it was challenging to create such an environment. The test administrators strictly followed the instructions from the authors of the DISC in terms of the instructions, presence of the parents/caregivers, etc. During the administration of social and self-help scales when possible the child was observed in a social setting, however, there were cases when the direct observation of a child's social and self-help skills were impossible and the test administrators used the parents/caregivers report on a given skill when acceptable.

The test administrators also were paying attention to the child's expectations that parents were setting prior to the test. With this purpose the parents/caregivers were asked to explain the child that it will be a play with toys, thus making the process predictable for the child before coming to the screening session. In certain circumstances, especially when the screening took place at health institution, it was difficult to build rapport with the child since the child was expecting some medical intervention associated with the current setting despite the initial explanation that were given to the child by parents/caregivers. The particular attention was given to the rapport building with the children. Before the screening each child was allowed to play with the ball, car and the examiner were using this opportunity to establish rapport with the child. The screening began when the examiner was getting an impression that the child is ready to collaborate and communicate. In spite of pre-screening rapport building, some children refused to collaborate and the examiner had to stop the screening in order not to get screwed results of the study, with the consent of the parents/caregivers new arrangement for another screening were made.

Analysis of results

Due to ethical reasons it was impossible to use a completely random sampling method, a stratified sample plan was used based on the consent of the parents. The main variables involved in the stratification of the sample were the following:

- Age
- Sex

The study population consisted of 250 children that participated in the study and were interviewed using the DISC. The results of 233 cases were valid and used in the study. The results of 17 cases were not used since some of the cases showed developmental problems, or the child refused to continue and did not come for the second session.

The study sample was divided into eleven age groups ranged from birth to 60 months (See: Table 1).

Table 1: Sample by age and sex

Age groups	Male n (%)	Female n (%)	Total Age groups n (%)
0 - 3	14 (60.87)	9 (39.13)	23 (9.87)
4 - 6	8 (38.10)	13 (61.90)	21 (9.01)
7 - 12	14 (51.85)	13 (48.15)	27 (11.59)
13 - 18	8 (42.11)	11 (57.89)	19 (8.15)
19 - 24	14 (63.64)	8 (36.36)	22 (9.44)
25 - 30	9 (36.00)	16 (64.00)	25 (10.73)
31 - 36	7 (43.75)	9 (56.25)	16 (6.87)
37 - 42	11 (55.00)	9 (45.00)	20 (8.58)
43 - 48	11 (44.00)	14 (56.00)	25 (10.73)
49 - 54	8 (53.33)	7 (46.67)	15 (6.44)
55 - 60	12 (60.00)	8 (40.00)	20 (8.58)
Total	116 (49.79)	117 (50.21)	233 (100)

As shown in Table 1 the gender of the sample was almost evenly distributed: 116 males and 117 females. The study was conducted in two districts of Baku city that are representative of the city and some random rural areas of the country (See: Table 2 & 3).

Table 2: Sample by geographic region

Study districts	n	%
Surakhani	80	34.33
Nizami	77	33.05
Other rural	76	32.62
Total	233	100

Table 3: Sample by urban/rural residence

Study districts	n	%
Urban	157	67.38
Rural	76	32.62
Total	233	100

The relationship between a child's performance on the DISC scales and certain demographic characteristics (gender & geographic region) of the child was assessed using one-way analysis of variance. The difference between the results of male and female children was tested using T-test for independent samples. The relationship between child's performance on the DISC scales and the geographic location the child resides in was studied using one-way ANOVA.

According to the results of t-test no significant difference was found on $p<0.05$ among male and female children (Table 4). The results of ANOVA showed that the location does not have significant impact on children's DISC performance (Table 4).

Table 4: Relationship between Demographic Characteristics and DISC Performance

Scales	T-test			ANOVA
	Male	Female	t	F
F.M.	15.48	15.38	1.11	1.1
R.L.	15.34	15.29	0.05	0.39
E.L.	14.82	14.86	-0.05	0.67
G.M.	15.62	15.43	0.19	0.2
A.-A.&M.	15.06	14.94	0.12	0.77
V.-A.&M.	14.9	14.9	-0.002	0.41
S.H.	15.41	16.04	-0.6	0.28
Soc.	15.84	16.23	-0.38	1.04

Reliability Analysis

Each item score was correlated with the item number in order to identify the level of hardness of each item. Items that got 75% or more show the level of children's passing of this item. The lower and higher end items of the DISC got lower correlation than those in the middle, which is normal for this type of tool as admitted by the author of the tool as well (Table 5).

Table 5: Correlation between Item and DISC Scale Score N=233

Item No.	F.M.	R.L.	E.L.	G.M.	A.-A.&M.	V.-A.&M.	S.H.	Soc.
1	0.16	0.09	0.16	0.18				0.07
2	0.15	0.11	0.10	0.24	0.13			0.08

3	0.36	0.31	0.22	0.27	0.26	0.27	0.24	0.22
4	0.39	0.42	0.38	0.49	0.31	0.46	0.29	0.20
5	0.51	0.43	0.46	0.54	0.40	0.46	0.60	0.46
6	0.56	0.70	0.58	0.52	0.51	0.54	0.71	0.57
7	0.62	0.76	0.73	0.71	0.69	0.64	0.74	0.63
8	0.72	0.72	0.81	0.67	0.62	0.74	0.74	0.69
9	0.77	0.84	0.83	0.81	0.75	0.70	0.75	0.78
10	0.81	0.88	0.79	0.83	0.73	0.80	0.83	0.78
11	0.81	0.89	0.83	0.81	0.83	0.82	0.80	0.86
12	0.84	0.88	0.85	0.83	0.81	0.86	0.83	0.85
13	0.86	0.88	0.87	0.83	0.83	0.86	0.81	0.86
14	0.88	0.89	0.88	0.84	0.86	0.88	0.87	0.88
15	0.87	0.89	0.87	0.85	0.86	0.86	0.85	0.87
16	0.89	0.86	0.88	0.83	0.86	0.88	0.86	0.89
17	0.89	0.89	0.86	0.83	0.86	0.88	0.86	0.88
18	0.88	0.85	0.84	0.83	0.84	0.87	0.83	0.86
19	0.89	0.82	0.73	0.78	0.82	0.85	0.80	0.81
20	0.84	0.81	0.79	0.78	0.80	0.84	0.78	0.86
21	0.88	0.82	0.82	0.76	0.79	0.77	0.79	0.79
22	0.77	0.62	0.70	0.74	0.68	0.70	0.69	0.71
23	0.79	0.60	0.68	0.68	0.66	0.70	0.60	0.78
24	0.75	0.66	0.74	0.64	0.66	0.60	0.56	0.68
25	0.65	0.50	0.48	0.58	0.56	0.65	0.65	0.57
26	0.58	0.58	0.23	0.37	0.55	0.51	0.57	0.65
27	0.42		0.25	0.64	0.32	0.56	0.40	0.53

All correlations are significant at $p<0.05$.

The average score of children of all age groups was 15 for almost all of the DISC scales, only social skills scale got the average score of 16. In the original study on DISC in Canada the average score for the most of the scales was 18 and by comparing this with the average score of the children in Azerbaijan we can see that the results of Azerbaijani children lower than the results of Canadian children. Taking into account cultural differences between these two populations (target and source) we can assume that this difference is not an indication of developmental delay but the indicator of a need for adjustment of norm tables according to the results of Azerbaijani children (See: Table 6).

Table 6: Means and Standard Deviations of DISC Scales for the Sample

Age Group	F.M.	R.L.	E.L.	G.M.	A.-A.&M.	V.-A.&M.	S.H.	Soc.
0 - 3 months								
Mean	3.3	4.34	3.78	3.52	4.44	3.68	3.74	4.13
SD	1.26	1.23	1.28	1.7	1.56	1.32	1	1.39
4 - 6 months								
Mean	5.52	5.76	5.19	5.61	6.24	5.66	4.95	6
SD	1.75	1.04	1.03	1.6	1.67	2.03	1.2	1.7
7 - 12 months								
Mean	8.07	7.77	7.55	8.74	8.74	8.11	8.85	8.66
SD	1.35	1.56	1.52	1.91	1.09	1.12	2.57	2.52

13 - 18 months								
Mean	9.89	10.11	11.68	12	10.79	10	11.73	11.68
SD	1.82	2.56	2.33	2.24	2.3	2.13	2.6	3.38
19 - 24 months								
Mean	13.36	13.73	13.45	15.31	13.9	13	14.22	16.04
SD	2.15	2.93	2.15	2.5	1.74	2.3	2.54	4.34
25 - 30 months								
Mean	15.96	16.68	16.28	16.48	15.68	15.88	18.04	17.56
SD	2.55	2.85	1.93	1.87	2.13	2.65	2.97	3.61
31 - 36 months								
Mean	21	19.44	18.38	18.87	17.75	18.69	20.63	19.25
SD	3.61	2.73	2.75	2.03	2.17	1.57	2.06	2.38
37 - 42 months								
Mean	22.5	22.2	20.4	21.4	20.5	21.1	22.2	22.8
SD	1.7	2.23	2.21	1.7	2.21	1.55	1.67	2.48
43 - 48 months								
Mean	24.28	23.16	22.68	23	21.88	22.36	22.88	23.92
SD	1.74	2.21	1.86	2.4	1.64	2.3	2.55	2.43
49 - 54 months								
Mean	25.8	25	24.73	25.5	24.66	25.07	25.4	25.6
SD	1.52	2.34	1.53	1.19	1.95	1.59	1.91	1.45
55 - 60 months								
Mean	26.15	25.85	24.65	26	25.6	26.35	26.1	26.15
SD	0.93	1.23	0.81	1.02	1.42	1.38	1.02	1.08
Overall								
Mean	15.42	15.31	14.84	15.52	15	14.9	15.73	16.04
SD	8.25	7.84	7.48	7.68	7.16	7.69	7.93	8.01

With the purpose of testing for scale reliability the inter-correlations among eight DISC scales were conducted. Eleven age groups were divided into three groups: 0-18 months, 19-24 months, and 49-60 months. The results showed that all of the correlations were significant within the first two age groups (0-18 & 19-24). It was interesting to see that social skills did not have significant correlation with fine motor skills in the third age group (49-60 months) (See: Table 7). This issue also arose during the study on DISC conducted by the authors of the tool in Canada. The author of DISC gives the following explanation to the phenomenon "At the younger age levels, the scales seem to be largely interchangeable. As age increases, abilities become more diversified. This tendency for the correlations to decrease with age is suggestive of a clearer differentiation among DISC scales as children attain higher level of development."

Table 7: Inter-correlations of the DISC Scales Scores
Group 1: N=90
(0-18 months)

	F.M.	R.L.	E.L.	G.M.	A.-A.&M.	V.-A.&M.	S.H.	Soc.
F.M.	-							
R.L.	0.76	-						
E.L.	0.80	0.83	-					
G.M.	0.89	0.86	0.86	-				
A.-A.&M.	0.83	0.87	0.86	0.88	-			

V.-A.&M.	0.86	0.77	0.79	0.87	0.86	-		
S.H.	0.84	0.81	0.81	0.90	0.84	0.78	-	
Soc.	0.79	0.86	0.82	0.87	0.84	0.80	0.83	-

Group 2: N=82
(19-42 months)

	F.M.	R.L.	E.L.	G.M.	A.-A.&M.	V.-A.&M.	S.H.	Soc.
F.M.	-							
R.L.	0.86	-						
E.L.	0.81	0.86	-					
G.M.	0.80	0.78	0.77	-				
A.-A.&M.	0.78	0.85	0.81	0.77	-			
V.-A.&M.	0.82	0.86	0.82	0.82	0.85	-		
S.H.	0.73	0.72	0.75	0.74	0.68	0.79	-	
Soc.	0.63	0.64	0.69	0.56	0.61	0.71	0.67	-

Group 3: N=59
(43-60 months)

	F.M.	R.L.	E.L.	G.M.	A.-A.&M.	V.-A.&M.	S.H.	Soc.
F.M.	-							
R.L.	0.71	-						
E.L.	0.61	0.73	-					
G.M.	0.44	0.47	0.62	-				
A.-A.&M.	0.57	0.54	0.58	0.66	-			
V.-A.&M.	0.55	0.58	0.69	0.71	0.71	-		
S.H.	0.38	0.37	0.47	0.71	0.51	0.64	-	
Soc.	0.16	0.39	0.49	0.60	0.48	0.53	0.58	-

DISCUSSION

The results of the current study demonstrates that there are differences in two populations of interest (Azerbaijani and Canadian population) what in turn justifies the need for cross-cultural adaptation of the DISC to Azerbaijani context.

As recommended by the ITC guidelines (2010), the forward-and-back-translation method was used for adapting the DISC. Three carefully selected translators were used for these purposes and I believe that this helped to minimize errors in this regard. Tanzer and Sim (1999) cautioned that literal translation can yield invalid test adaptations; rather, they noted that certain terms "must be replaced with expressions from the target culture that have the same meaning" (p. 261). With the purpose of increasing the validity of the adaptation of the DISC certain culture specific terms and expressions were given particular attention to determine appropriate replacement for them.

Another concern is a sample of the study that mainly consisted of the children residing in Baku city. Baku is a capital of the Republic of Azerbaijan and differs from other regions of the country, therefore, the results obtained can't be applied to the whole country. It would be helpful to conduct the population study in future.

Due to the size and distribution of the sample some of statistical methods were not used, such as confirmatory factor analysis, etc. Future studies with the larger population sample using the Azerbaijani version of the DISC can provide a basis for these analyses.

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