Original Article

Test-retest Reliability of the Persian version of the questionnaire Affordances in the Home Environment for Motor Development-Infant Scale and its Relation with Infant Movement

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ABSTRACT

Background: Since the home environment is the first place on which children (particularly, those under two years of experience and development) are highly dependent, the existence of a questionnaire for evaluating this environment is necessary. Therefore, in the present study, the test-retest reliability of the Affordance in the Home Environment for Motor Development-Infant Scale (AHEMD-IS) is reported.

Methods: The aim to this study was to investigate certain psychometric characteristics of the AHEMD-IS. Therefore, 112 mother-infant (3–18 months old infants) couples participated in this study. The AHEMD and the Ages and Stages Questionnaire (ASQ) were completed by all the participants and 46 participants re-completed the questionnaire for investigating their repeatability. Finally, the collected data were analyzed using tests of correlation coefficients in SPSS-21.

Results: The findings of the AHEMD-IS enjoys acceptable reliability. The intra-class coefficient (ICC) of the total score of the questionnaire was 0.78, the intra-class coefficient of physical space was 0.96, the intra-class coefficient of a variety of stimuli was 0.93, the intra-class coefficient of the gross motor toys was 0.93, and the intra-class coefficient for fine motor toys was 0.96. In addition, the concurrent validity indicated that the section on the diversity of stimuli and toys for fine movements had a significant correlation with the motor sections of the ASQ (P<0.5).

Conclusion: The results of this study indicated that the AHEMD-IS is a reliable instrument for 3–18 month old infants.

Introduction

The World Health Organization (WHO) presents a wide range of environmental factors that are dependent on the individual's suitable participation. In sciences related to human development, child development is considered as the result of interactions between environmental and biological factors [1]. Gibson and Bronfenbrenner are among those scholars who have investigated the effectiveness of the environment on child development [2].

In texts related to occupational therapy, the environment includes two general groups: human environments and physical environments. Human environments such as family is one element in the human environment of each child that has profound effects on their participation [1]. A physical environment such as the home environment is one of the most primary environments that children experience. Therefore, the quality of such an environment affects

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children's development and is a resource of opportunities that stimulates children's motor development, particularly in the ages of primary development [3]. Affordance is a basic concept in the ecological theory for activities [4]. Hiros states that affordance is an opportunity in which objects, events, and places provide the environment for performing organism actions [5]. Affordance is an opportunity that provides a unique potential for action, and consequently, the learning and development of a skill or some part of an ecological system [6]. Affordance of the home environment includes toys, materials, and tools, access spaces, different stimuli, and parental education [7]. Investigating the home environment as a physical environment and as the first opportunity provided for children's development seems significant. Thus far, a lot of questionnaires have been developed for investigating the home environment. One of these questionnaires is the Affordance in the Home Environment for Motor Development-Infant Scale (AHEMD-IS). None of these questionnaires have been standardized in Iran yet, but they have been employed in some researches [8-9] Possessing a review on the conducted studies with this questionnaire indicates that those infants who had obtained high scores from this questionnaire had previously achieved better scores in motor domains [3]. In the investigations conducted by Carl Gabbard et al. on this questionnaire, the environment has been considered as a factor for appropriate development and behavior. They stated that this valid and reliable questionnaire can be used in clinical and educational spaces across different age ranges. The AHEMD-IS evaluates some aspect of the environment including physical space (PS) that is introduced inside and outside the space of home, the variety of stimulation (VOS) that is related to some activity in which parents participate with their babies, gross motor toys (GMT), and fine motor toys (FMT) [10]. In a study, Cronbach's alpha coefficient with Confidence Interval (CI) for the physical space (95% of CI=0. 695, 0.773) was 0.735; for variety of stimuli (95% of CI=0.566, 0.746) was 0.663; for gross motor toys (95% of CI=0.699, 0.810), it was 0.758; for fine motor toys (95% of CI=0.700, 0.809), it was 0.758; and for the final score (95% of CI=0.729, 0.800), it was 0.766 [11]. In other studies, for outside space (95% of CI=0.21_0.91), the result was 0.737; for inside space (95% of CI=0.43_0.94), it was 0.810; for variety of stimulation (95% of CI=0.81_0.98), it was 0.936; for fine motor toys (95% of CI=0.80_0.98), it was 0.934;

for gross motor toys, (95% of CI=0.77_0.98), it was 0.925, and for the total (95% of CI=0.82_0.98), it was 0.940 [3].

A study was conducted exploring the effect of the home environment on older children's motor development in Japan. In this study, researchers obtained results indicating that the home environment is generally sufficient for children's motor development and accessing toys for gross and fine movements have great effects on their development [7]. The factors of the home environment that are related to children's motor development are as influential as the biological` factors [12]. Since there exists no standardized questionnaire in Iran for assessing the children's development environment, hence, the translation, validity, and reliability of the AHEMD-IS have been assessed in a comprehensive study. The present paper is a report on the reliability assessment section of this questionnaire in this comprehensive project.

Methods

To investigate the test-retest reliability of the Persian version of the AHEMD-IS, 112 mother-infant couples (62 infants in the age group of 3–11 months and 50 infants in the age group of 12–18 months) participated in the present cross-sectional methodological study.

For this study 112 participants were selected using convenience sampling method. These participants were selected among the set of qualified mothers who were referred to the main healthcare centers of Shiraz city between 2015 and 2016. They were referred in order to monitor their children's development, vaccination and measuring their height and weight.

The inclusion criteria were as follows:
1. Interested in participating in the study
2. Having the lowest level of literacy needed to read
3. Having children under the age of one and a half years
4. Not suffering from psychiatric disorders and hypothyroidism according to the health files existing in healthcare centers
5. Not having children suffering from hydrocephalus or microcephaly and neurological and orthopedic disorders
6. Not having children under the gestational age of 37 weeks old.

The participants' demographic characteristics are mentioned in Table 1.

Table 1: Demographic characteristics

	3–11 months (n=62)	12–18 months (n=50)
Age	6.93±2.26	13.42±2.76
Sex	51.6 female 48.4 male	46% female 54% male
Birth weight	3166.85±385.36	3103.46±627.16
Gross motor score	50.9±10.26	55±8.74
Fine motor score	51.53±11.43	54±7.44
Mother's education	48.4%≤12years 51.6%≥12 years	54%≤12 years 46%≥12years
Mother's age	28.74±4.49	31.08±4.89
SES (education-salary)	Class1 (37%) Class2 (31%) Class3 (20.1%) Class4 (12.9%)	Class1 (18.2) Class2 (52.4) Class3 (15.7) Class4 (13.7)

The data collection instruments are as follows:

Ages and Stages Questionnaire (ASQ):

This test evaluates the developmental state of 4–6 month old children in 19 different age groups and in five developmental domains (gross motor development, fine motor development, communication, problem solving, and personal-social domains), and compares the determined cross-sectional points. For each age group, there are 30 questions in total (six questions for the developmental domain) and the highest obtainable score for each question is 10. For each developmental domain, therefore, the total scores can be 60. This test employs clear and fluent language. Apart from questions, this test contains simple pictures for increasing the clarity of the question. The test is cheap and its administration takes only 10 minutes. In different studies conducted on different populations of children, it was indicated that this test is a valid and trustworthy screening test even in its translated and domesticated versions. In a study conducted in 18 countries across Asia, Africa, Europe, North and South America in 2007, the sensitivity and characteristics of this test were obtained as 0.88 and 0.825, respectively. The validity and the reliability of this test have been confirmed in Iran [13].

Affordance in the Home Environment for Motor Development-Infant Scale (AHEMD-IS):

It is a questionnaire that is used as a research instrument in several countries such as Portugal, Brazil, etc. Its validity and reliability have been confirmed.

It is a self-report instrument for parents that investigates the quality and quantity of the factors of families that result in enhancing children's motor development, particularly those aspects of family such as physical space, the diversity of stimuli, and interaction with toys within the age group of 3–18 months. Since the first release of this questionnaire in 2011, it has been considered a descriptive instrument with primary validity. It has been used as a research and clinical instrument. Its English and Portuguese versions are available on the website.

This instrument consists of two parts: 3–11 months and 12–18 months. Using the 41 questions and four domains of physical space (PS) (indoors and outdoors), variety of stimuli (VOS), gross motor toys (GMT) and fine motor toys (FMT), it scores the home environment. Generally, four ranks are considered on this scale:

1. Less than adequate
2. Moderately adequate
3. Adequate
4. Excellent

Each of these domains has variables such as exteriors, external devices, interior surfaces, interior devices, interior space, interior playgrounds, game stimulation, the domain for freedom of movement, stimuli encouragement, daily activities, pattern and model toys, toys and games to be made, musical instruments, materials with the property of manipulation, portable devices, etc. [14].

All the 112 participants (mothers with the inclusion criteria mentioned above) conferred to the health center for baby caring services, completed both questionnaires for investigating the mean scores of AHEMD-IS and the relationship between some aspect of the home environment and the motor development scores in the ASQ. After telephone negotiation for performing a retest of the AHEMD-IS, only 46 participants declared their readiness for re-competing the questionnaire. These participants were, therefore, invited to the healthcare centers to re-complete the questionnaire for probing repeatability and the intra-class coefficient (ICC) during a two-week interval.

Statistical Analysis

After entering the data into the SPSS-21 software, the data were analyzed using the Spearman correlation coefficient test and the intra-class coefficient test (ICC).

Results

A description of the data indicates that the final rate of this questionnaire for the sample of the present study is sufficient. Other data related to scores as well as the final score and rate, and the scores of the different sections of the questionnaire are presented in Table 2. As indicated

Table 2: Mean scores and the SD of the items of the AHEMD-IS and their relationship with the scores of motor movement in the ASQ

AHEMD SBSCALES	AHEMD-IS 3–11M (N62)	AHEMD-IS 11–18M N 50	Total score AHEMD-IS3-18M (N112)	Spearman ration FINE&GROSS Movement scores (ASQ) and AHEMD-IS					
				3–11M		12–18M		3–18M	
	MEAN±SD (RANKING)	MEAN±SD RANKING	(percentile)	fine	Gross	Fine	Gross	Fine	Gross
SPACE	4.33±1.91 (Adequate)	4.3±2.22 Moderately adequate	35.7% Excellent	0.11	0.11	0.1	0.02	0.06	0.11
VARIETY OF STIMULATION	11.82±3.09 Moderately adequate	14.36±1.8 (Adequate)	34.8% Adequate 21.4% Moderately adequate	0.29*	0.29*	0.17	0.02	0.18*	0.19*
GROSS MOTOR TOYS	6.58±2.25 (Adequate)	8.52±2.89 Moderately adequate		0.06	0.09	0.01	0.14	0.02	0.05
FINE MOTOR TOYS	3.87±2.41 Moderately adequate	9.92±4.55 Moderately adequate	8% Less adequate	0.18	0.16	0.05	0.28*	0.11	0.04
TOTAL SCORE	26.61±5.9 (Adequate)	37±7.74 Adequate		0.27*	0.06	0.02	0.18	0.16	0.06

*Correlation is significant at the 0.05 level of P value

in the table, the environments are inappropriate for motor development in only 8% of the children's families in this research.

The results of the correlation coefficient test indicated that there is a significant correlation between fine and gross movements in the ASQ with a section on environmental stimuli in children aged 3–11 months. In addition, there is a significant correlation between gross movements and toys for fine movements in children aged between 12 and 18 months. Moreover, the final score of this questionnaire for children aged 3–11 months shows a significant correlation with the section on toys for fine movements in the ASQ. These results are illustrated in Table 2.

In investigating the reliability of the score of the questionnaire, the results of correlation coefficient test and the ICC test indicated that both the final score and the scores of the different sections of the questionnaire enjoyed acceptable reliability. The results of these tests and the confidence interval are presented in Table 3.

Discussion

The present study showed that the AHEMD questionnaire has an acceptable reliability to assess the home environment for 3-to-18-month old infants. As it seen in the results, the homes of 35.7% of children in the study were excellent in terms of providing environments for motor development. In the case of 34.8% of infants, the homes provided adequate environments; in case of 21.4% of infants, the environments was moderate; and only in the case of 8% of infants, the homes provided inadequate environments. Therefore, it seems that most children grow up in perfect settings for motor development. The manner of changes in the provision show that children below one year of age get lower marks than children older than one year with regard to the use of fine motor toys and the variety of stimuli. One reason for this could be the parents' lack of knowledge about stimulating toys with fine movements and their lack of awareness of the importance of interaction with their children. In the case of fine and gross motor toys in both age groups, the scores obtained in this study suggest that children did not have access to sufficient number of toys. Given that the provision of articles of entertainment for a newborn baby is culturally essential, there are prepared toys for children, but it is clear that these toys are not scientifically appropriate for the developmental level and age of the child.

According to the results and scores of the test-retest, this questionnaire's repeatability factor ranges between 0.83 and 0.95, and has a high repeatability in Iran.

The relationship of the final score of the questionnaire and its various elements with the score of the fine and gross questionnaire of the ASQ results showed that only VOS and FMT have significant relations in the ASQ; the other parts of questionnaire and the final score are not related with the ASQ. The reasons behind this lack of correlation can be due to the fact that the majority of children considered under the AHEMD-IS questionnaire are at an adequate and excellent level in terms of score.

The number of children who were in the relatively satisfactory and unsatisfactory levels was low—that is why there was a low diversity in these groups to establish a comparison of ASQ scores. On the other hand, the ASQ questionnaire shows above-average scores in all children. Therefore, as there were no grades lower than the average in the ASQ questionnaire, the results were not significant in comparison to the AHEMD. Perhaps in a larger sample size or using a tool that assesses the movements with greater sensitivity, different results would ensue.

The results of the study conducted by Cacola et al. also suggest that the final score of the questionnaire has an alpha of 0.66, and therefore, they had also achieved a moderate internal consistency for the questionnaire. Since the questionnaire for the ages 3–18 months has been conducted in three studies, therefore, there is no more information to compare the results.

In general, as mentioned in several previous studies, this questionnaire can be used as a guide for occupational therapists and experts in the field of child development working with the Iranian house environment. It can be also be used for designing the environment for normal children or those at risk [15]. It should, however, be noted that this questionnaire only provides a cross-sectional image and represents the way of passing time and details about children and their parents' activities (11).

The lack of cooperation of some health centers, the lack of space to complete the questionnaire, the unavailability of family files, coincidence of work time with parents' work time, the lack of parents' response to phone calls, the lack of attention of some of Iranian parents to their children's development, and the unwillingness to attend and complete the questionnaire because of economic problems and cultural conflicts were amongst the major limitations of this project.

Studying the relationship between the provision of the

Table 3: Reliability features of the questionnaire

Subscales		AHEMD-IS(≤11M and >11M)	
		ICC (n=46) (confidence interval)	Test-retest (n=46)
PS (OS and IS)		0.96 (0.93−0.98)	0.93*
VOS		0.93 (0.88−0.96)	0.88*
GMT	≤11 M	0.78 (0.51−0.9)	0.75*
	>11 M	0.93 (0.83−0.97)	0.89*
FMT	≤11 M	0.84 (0.6−0.93)	0.86*
	>11 M	0.96 (0.84−0.99)	0.96*
Total score		0.87 (0.83−0.97)	0.83*

*Correlation is significant at the 0.05 level of P value

family home environment with the economic and social situation of the families to be assessed is recommended that for future studies because it will shed light on certain differences in the questionnaires in different health centers in the city with different family status, income, and education. As it was not part of this study, no statistical study in this field was developed.

Moreover, the section of toys would be evaluated more accurately and in detail in a qualitative study so as to let the researcher understand the knowledge of the parents with regard to these toys and help them figure out how to work with them, and how to fit the toys in the developmental stages of children.

Conclusion

The findings of this study suggest that the AHEMD-IS is a reliable instrument for assessing how suitably environments home afford movement and potentially promote motor development.

This instrument has the potential to be very useful for the occupational therapist in measuring the quantity and quality of affordances in the home environment that are conducive to an infant's motor development.

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