Original Article

Validity and Reliability Determination of Parents Evaluation of Developmental Status (PEDS) in 4-60 Months old Children in Tehran

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Objectives: There are various developmental screening tools that are different in terms of psychometric characteristics and choosing the best one is challenging for the pediatrician. This research was designed to identify the validity and reliability of Parents Evaluation of Developmental Status, a developmental screening questionnaire, in 4-60 months-old children in the city of Tehran.

Methods: In order to validate the Parents Evaluation of Developmental Status, a precise translation of the questionnaire was performed by the research team. A Persian version was back-translated by three English language experts who were unfamiliar with the Parents Evaluation of Developmental Status. The back-translated version was compared with the original version. The content validity of the finalized Persian version was verified by three pediatricians. The questionnaire was performed on 648 children ranging from 4 to 60 months old in healthcare clinics. A test-retest method with 2-3 weeks interval and Cronbach's α were used in order to determine the reliability of the questionnaire.

Results: All of the questions in Parents Evaluation of Developmental Status had desirable content validity and there was no need to change them. The total Cronbach's α coefficient was 0.63, which, when considering the low number of items in Parents Evaluation of Developmental Status, is acceptable. The test-retest correlation coefficient was determined to be 0.87, which is desirable. The estimated Kappa measure agreement between Parents Evaluation of Developmental Status and Ages and Stages Questionnaires was 0.30. Due to the rather large sample size and similarity of the screening results by both questionnaires in 71.5% of cases, it is possible to conclude that this measure is an acceptable one.

Discussion: This research showed that Parents Evaluation of Developmental Status has a good content validity and reliability and can be used for developmental screening of children in Tehran city. Because the test is brief, using it can lead to saving time and resources.

Keywords: development, developmental delay, screening, PEDS, ASQ

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Introduction

One of the most important aspects of health for children is normal development. In recent years there is increasing interest and attention on child development. Although health policymakers have tried to increase the rate of early detection and referral for early intervention services, developmental delays are still a challenging issue in pediatric medicine. According to reports, about 10-16% of children in various countries have developmental disabilities (1-4). This high prevalence indicates the importance of early detection and referral for intervention services. Although the importance of early detection and intervention for developmental disorders is well-known, there are different barriers to its fulfillment. Limitation of time, resources and also professional expertise and knowledge about screening are some of these barriers. There are various developmental screening tools that are different in psychometric characteristics and choosing the best one is challenging for the pediatrician. One of the most important challenges is the cultural differences between various populations. It is clear that any judgment about child development must be done while considering the cultural impacts (5,6).

The developmental screening tools that can be used for this purpose are of two types, including objective ones that are performed by health care providers and subjective ones (questionnaires) that can sometimes be completed directly by parents or caregivers. In

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recent years there is an increasing tendency to use parent-report developmental screening questionnaires. Many researches have shown that when the questionnaires are correctly presented to parents, despite the socio- economic status, geographic region, educational level and child rearing experiences, nearly all parents can present correct information about their child's development. If we provide the questionnaires in a correct manner to them, their concerns about their child's development is very reliable and is able to increase the detection rate of childhood developmental disorders (7-13). It is clear that objective tests are time-consuming and need more time and expertise. On the other hand, many researches have shown that clinical judgment alone isn't enough for detecting developmental delays (12,14,15). Thus, using parental questionnaires is an easy and practical way for screening. In this study, we used Ages and Stages Questionnaires (ASQ) and Parents Evaluation of Developmental Status (PEDS), two commonly used developmental questionnaires.

Human development is affected by dynamic interactions between biologic factors and experiences, risk factors and protective ones. About 10-16% of children are at risk of developmental disorders. By early detection and referring for early intervention services (EIS), especially in the first 3 years of life, there is increasing chance that these children can reach their maximal developmental potentials. Identifying developmental disorders before 3 years of age has a great impact on childhood health and well-being (16,17). The adaptability of the growing brain in the first 3 years of life leads to a high effectiveness of intervention services. Studies have shown that low income children who received EIS between birth and 5 years of age had better reading and mathematical skills at age 15, in comparison to those who received these services between 5 to 8 years of life (18). Empowering the children before school entry, especially in low income regions, can result in a reduction of the rate of early academic failure, behavioral problems in school including drop-out in high school, delinquency, joblessness and mental health problems (18). Delayed diagnosis of those problems that can be treated or at least managed effectively in the early years of life leads to the increase of costs of using special education as well as special medical services (4). Thus American Academy of Pediatrics (AAP) emphasizes frequent and timely scheduled developmental screening in order to diagnose at-risk children. The best setting for performing developmental screening is the pediatrician's office, because this is the only place where professionals have formal, longitudinal and routine contact with young children in their early years of life (19,20).

Because PEDS is a brief, simple and easy-to-use developmental screening tool, we decided to evaluate its validity and reliability in the city of Tehran in order to provide a simple tool for childhood developmental screening in this large capital city.

Methods

This research is an action research that was performed from August 2013 to April 2014 in 4 child healthcare centers located in the north, south, east and west regions of Tehran. PEDS is one paper questionnaire containing 10 simple questions that elicit parental concerns about different developmental or behavioral domains. The questions don't ask about a specific developmental skill. There are two open end questions that provide opportunities to identify more general concerns of parents (21). Based on the test instructions, the value of each question is different for various age groups. It means that based on the child's age, some questions are considered "predictive" and are more likely to be indicative of a developmental issue (22). After completing the form, the provider scores it and categorizes children in 5 possible paths: Path A: when 2 or more significant concerns are present and the child should be referred. Path B: when there is only one significant concern and the provider may administer a second screen or refer for further screening. Path C: parents have 1≥ non-significant concerns. Path D: when parents have difficulty communicating and providers have to consider alterative detection methods. Path E: when there are no concerns (23).

In this study, the examiners only provided the PEDS form to parents and scoring was performed by the research team. We categorized children in 3 main groups compatible with path A (fail), path B (suspect) and a group including those compatible with paths C, D or E (normal). First, a precise translation of the questionnaire was done by the research team and then the Persian version was back-translated by three English language experts, who were unfamiliar with the PEDS. The back-translated version was compared with the original version. Next, the content validity of the finalized Persian version was verified by three pediatricians familiar with child development and also by

reviewing relevant books and journals. Then, the parents of 648 children 4-60 months old completed the questionnaires in four healthcare clinics located in the north, south, east and west regions of Tehran city. The inclusion criteria were: 1- age between 4 to 60 months, 2- Iranian nationality, 3- living in Tehran city and 4- parental consent and cooperation. Exclusion criteria were: 1- having obvious developmental delay or disability, 2- parental refusal to cooperate.

Since no developmental gold standard diagnostic tests were accessible at the time of the study, these children were also evaluated by ASQ simultaneously and the Kappa agreement coefficient between PEDS and ASQ was estimated. Available sampling was used until the desired sample number was achieved. Test-retest methods (by 2-3 weeks interval) and Cronbach's α were used in order to determine the reliability of the test. This research was approved by the ethical committee of the University of Social Welfare and Rehabilitation Sciences. Parents completed a written consent form for participation. The parents whose children were detected to have developmental problems were informed and guided.

Results

The mean age of the children studied was 26.0±16.11, and 54% (350) of them were boys. In 95% of cases the person who completed the questionnaire was one of the parents. 3% of children were born preterm for whom the corrected age was calculated and used, if under 24 months old. Educational levels of 51.7% and 34.3% were seen in mothers at college and high school level, respectively. All of the questions in PEDS had desirable content validity and there was no need to change them. The total Cronbach's α coefficient was 0.63. As table (1), the correlation coefficient of the test and retest of the questionnaire was 0.87 (P<0.001) and the interclass correlation coefficient interval was 80-91 % (P<0.001).

Table 1. ICC for test – retest examination by PEDS

Cronbach's α	ICC interval	ICC amount
0.87	0.80-0.91	0.886

The estimated Kappa measure agreement between PEDS and ASQ was 0.30 (P<0.001) and the Pearson's chi squared test was determined to be 115.98 (P<0.001). Developmental disorders were observed in 23.1% of children (4.6% delayed and 18.5% questionable) who were examined by PEDS, and in 26.4% of children who were examined by ASQ (14.7% delayed and 11.7% questionable) (table 2).

Table 2. Comparing the results of ASQ and PEDS

	PEDS results: No. (%)			
ASQ results No. (%)	Normal	Delayed	questionable	total
Normal	415(64)	9(1.4)	53(8.2)	477(74.6)
Delayed	54(8.3)	11 (1.7)	30(4.6)	95(14.7)
questionable	29(4.7)	10 (1.5)	37(5.7)	76(11.7)
total	498(76.9)	30(4.6)	120(18.5)	648

For factor analysis we used the Kaiser-Meyer-Olkin measure, and the value of this measure was 0.77 (P<0.001). Also, Rotative method showed that questions 5-9 and 2-4 were the most and more important questions, respectively. Questions 1 and 10, the two open-ended ones, were the least important questions.

Discussion

This study showed that PEDS has good content validity. The test also had good reliability in test-retest. The total Cronbach's α coefficient wasn't very high, but when considering the low number of items in PEDS, the estimated value is acceptable. Although the kappa measure agreement between PEDS and ASQ was not good, because of the large sample size and the similarity of results in 71.5% of cases, it is possible to conclude that this measure is acceptable and good enough for screening 4-6 month-old children in Tehran city. A study performed in the USA showed that PEDS had high validity and reliability (test-retest reliability of 0.98-0.99 and inter-rater reliability of 0.82-0.92) (24). According to the literature, the sensitivity (0.79) and specificity (0.89) of PEDS is moderate (25-27). The questionnaire has been re-standardized recently and

is actually being using in several countries for children's developmental screening. There was no significant difference between the developmental status of term and preterm children; nor did birth order, maternal educational level or child's relation to the person who completed the questionnaire have any significant relationship with the results of PEDS. However, there was a significant relationship between the place of living, and the age ($p<0.001$) and sex ($p= 0.03$) of children with the test results. National studies performed in Iran using ASQ, PDQ and DDST-II have showed no relationship between place of residence, sex, age and maternal educational level with the results of these tests (28-30). These studies have also showed weak agreement between the results of developmental screening using ASQ and PDQ, ASQ and DDST-II and also PDQ and DDST-II (28-30). Scies et al. also showed that the agreement between results of PEDS and ASQ was low and the disagreement was greater in the speech and communication domain (31). According to the authors of the same study, since using both of these two tests is recommended by AAP, the importance of interpreting test results by practitioners becomes evident(31). Although there are still some challenges facing developmental screening overall, recent studies show that the use of these two questionnaires is increasing today. The result of a study that compared the use of developmental screening tools by practitioners between 2002 and 2009 showed that the rate of using the ≥1 developmental screening tool in 2009 was twice as great as 2002. In 2009, a larger number of practitioners used ASQ and PEDS (20). However, these two tools have different approaches: ASQ asks parents about the child's specific skills but PEDS includes more general questions and seeks parental concerns (31). PEDS is currently used in many countries for childhood developmental screening. The results of one study showed that it was useful to present PEDS to parents before a well-child visit and practitioners believed that the tool improved their ability to diagnose developmental disorders (32). A study carried out by King showed that the number of suspect cases resulting from developmental screening by PEDS were twice that of screening by ASQ, but that practitioners tended to refer the suspect cases resulting from ASQ more than those of PEDS (33).

In this study, 4.6% and 18.5% of children were categorized as path A (fail) and B (suspect), respectively. In one study designed to determine the success of PEDS in identifying developmental delays of children in Tanzania, the researchers showed that 35% of children were defined as path A (while 10% was anticipated), 60% as path C or nonspecific concern (while 20% was anticipated) and 5% as path E (while 20% was anticipated). It is possible that using the word "concern" in the test items of PEDS was responsible for this high rate of path A children. Actually, many mothers were worried about the high rate of malaria and other extrinsic environmental threats and concerns such as decreased appetite, nutrition, fever, etc., instead of developmental disorders. Thus the authors recommended that before deciding about the widespread use of PEDS in this country, it would better to be standardized for children of Tanzania (23). Another study showed that the results of screening with PEDS in Australia was similar to the norm population of USA, and thus PEDS was recognized as suitable for using in this country (34). King et al. used PEDS in 1801 preschool children and their parents in Singapore. They concluded that in comparison to the norm population in USA and Australia, parental worries and concerns were greater in Singapore. By adjusting the cut off points, they found similar results to the norm American population. The authors recommended that interpreting the results of the test be performed by considering the cultural backgrounds of each community (35). Another study on 100 two-year-old children in Milton Keynes, England showed that PEDS is suitable for timely detection of developmental, behavioral, social and emotional status of children, timely referral for intervention services, good communication between parents and health care providers, and designing a clear plan for providing child health care (36). In one study, researchers evaluated parental notes written on 752 PEDS forms. 90% of parents had at least one concern and in 27% of cases they wrote notes on the forms. 23.7% of the written comments weren't related to the question and 25% of the concerns were advanced for the child's age. The authors emphasized that although developmental screening is useful in empowering well-child visits, they shouldn't replace the parent-physician relationship (22). Although in recent years child health policymakers have paid more attention to child development, the greatest attention of pediatricians is still focused on physical growth and their interest, sensitivity and education about child development is limited .In this situation using simple and easy-to-use tools such as PEDS, is highly recommended.

Although intervention services may not be accessible in all communities, researchers have shown that early diagnosis itself provides an opportunity for parental education and then parents can incorporate this knowledge in the daily care of their children such as bathing, holding, dressing, feeding, clothing, etc. Evidently, if these cares can be accompanied by intervention services, it will lead to a considerable impact on child development (37).

As there was not any diagnostic gold standard test accessible, we had to compare the PEDS with another screening tool, the ASQ that was recently standardized in Iran(38, 39). Due to the limitation of time and resources it wasn't possible to re-evaluate those children who were categorized as path A or B. However, we informed their parents and referred them for additional evaluation by experts.

Conclusion

This research showed that the validity and reliability of PEDS were acceptable for developmental screening of 4-60 month-old children in Tehran. Although the test is simple and doesn't refer to any specific skill, using it can lead to organizing the child health evaluation process. Also, it should lead to more thought about child development and, if there is any problem, referral for more evaluation and intervention services.

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