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The utility and reliability of the PreViAs questionnaire for the assessment of vision in Turkish neonates and infants

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ABSTRACT

Introduction: Evaluating the visual functions of children with an easy-to-use and evidence-based method during the preverbal period will enable early diagnosis and intervention of visual impairments. The aim of this study is to determine the utility and reliability of the Turkish version of the Preverbal Visual Assessment (PreViAs) questionnaire, which was developed to evaluate the visual functioning of preverbal infants.

Population and Methods: The PreViAs questionnaire was administered to primary caregivers of term infants under 24 months of age, and their responses were recorded.

Results: Data from the 278 participating infants were analyzed to assess the internal consistency of the PreViAs questionnaire. Results showed a high level of consistency with Cronbach's alpha value of 0.958 for the total score, suggesting strong internal coherence. In addition, the Cronbach's alpha values for each domain were 0.890, 0.913, 0.951, and 0.922 for visual attention, visual communication, visual processing, and visual-motor coordination, respectively, indicating good internal consistency for each subdomain.

Conclusion: The Turkish version of the PreViAs questionnaire is useful and reliable for assessing functional vision during the preverbal period.

Keywords: vision screening; infant; surveys and questionnaires; vision disorders.

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INTRODUCTION

There are 2.2 billion people all over the world who suffer from visual impairment.[1] Approximately two-thirds of childhood visual impairments are avoidable and treatable.[2] Undetected and untreated vision problems in the first few months of life can cause permanent vision loss. There are significant differences between countries in terms of the causes of childhood visual impairment.[3] Cortical/cerebral visual impairment (CVI) is the most common cause of visual impairment during childhood in developed countries, and its prevalence is increasing in developing countries.[4] As a result, in parallel with this trend, cerebral visual impairment has become the dominant cause of severe visual impairment in infants and children in Turkey as well.[5] However, regardless of the cause, early evaluation of children's visual functions is critical for follow-up and treatment.

Visual assessment in children is an essential part of medical care.[6] The evaluation of vision is often synonymous with the measurement of visual acuity. However, visual examination of preverbal infants is difficult because they cannot express their visual complaints. For preverbal infants, the assessment of vision is determined by their visual behavior rather than visual acuity.[7] Observing the infant's visual behavior in the examination room and obtaining answers from the family regarding the baby's vision history are diagnostic for detecting visual impairment in infants.

Various tools and methods are recommended for evaluating the visual functions of infants.[7,8] Observation of the child's reactions to environmental stimuli in the examination room, fixation reflex,[9] and preferential looking[10] are the most reliable methods for assessing visual function in infants. Providing access to health services that offer these examinations is essential for detecting and treating preventable vision impairments during childhood. However, during the COVID-19 pandemic, when access to medical centers was severely restricted, the importance of online assessment methods for patients became evident. At this point, some enhanced questionnaires have been developed to measure the visual function of infants as part of the clinical assessment. One of these questionnaires, the Preverbal Visual Assessment (PreViAs) questionnaire, was developed in 2014 to evaluate the visual functions of preverbal infants. It is a practical test with proven validity and reliability.[11,12]

The aim of this study was to adapt and determine the utility and reliability of the PreViAs questionnaire in Turkish. Through this process, this inexpensive and user-friendly method will become widely available for the early detection and monitoring of preventable visual disorders during infancy.

POPULATION AND METHODS

Material: The PreViAs questionnaire, developed by Pueyo et al. in 2014, is used to monitor visual development and detect abnormal visual behavior in preverbal infants under 24 months of age. The questionnaire presented in *Table 1* consists of a total of 30 questions across four visual performance domains: visual attention (VA), visual communication (VC), visual-motor coordination (VMC), and visual processing (VP), answered by parents or primary caregivers. Responses to the questionnaire are recorded as either "yes" or "no," and scoring is based on the number of positive answers. Each positive response is given a score of 1, and negative responses are given a score of 0. The overall score is calculated as the sum of the positive scores. The total scores for each domain differ according to the questions that are included, but the maximum total score that can be obtained from the questionnaire is 30 points. The maximum scores for the subdomains are 11 points for VA, 5 points for VC, 13 points for VMC, and 20 points for VP.[11]

To determine the psychometric properties and cut-off points of the PreViAs questionnaire in Turkish, the English version of the questionnaire was first translated into Turkish by two separate authors. The two translations were then compared and edited, and a back-translation was performed by a professional who was a native English speaker and proficient in Turkish. The back-translated questionnaire was then compared with the original questionnaire by the research team, and the final version was created. A copy of Turkish version of PreViAs is available upon request from the first author.

Before starting the study, the PreViAs questionnaire was administered to 20 families attending the developmental pediatrics outpatient clinic for routine follw-up. It was observed that parents did not have any difficulties in understanding or answering the questions, and they were able to complete the questionnaire without assistance.

Methods: Our study included typically developing children aged 0-24 months, except for those born prematurely or with severe ophthalmic

Table 1. The Preverbal Visual Assessment (PreViAs) questionnaire

Questions	Domain
1. Is your child interested in lights and fixes the eyes on them?	VA
2. Does he/she keep the eyes (for at least a few seconds) on objects or persons?	VA
3. Is he/she able to look towards a sound source?	VA
4. Is he/she able to move the eyes quickly between two persons or two objects?	VA, VMC
5. Does he/she follow the movement of a nearby object moving slowly horizontally and vertically?	VA, VMC
6. Does your child observe his/her own hands?	VA, VMC, VP
7. Does he/she try to reach for toys or objects with his/her hands?	VA, VMC
8. Does he/she pick up and manipulate objects, showing interest in them?	VA, VMC, VP
9. Does he/she turn to a sound source placed behind him/her?	VA, VMC, VP
10. Does he/she look in a mirror?	VA, VC
11. Does he/she look at the pictures of a storybook?	VA, VP
12. Does your child smile when his/her mother or father get close without making any sound?	VC
13. Does your child smile to people who approach him/her smiling?	VC
14. Does he/she imitate gestures or greetings?	VC, VP
15. Does he/she react to strangers by staring at them or being embarrassed?	VC
16. Does he look at the ground when an object is dropped near him/her?	VMC, VP
17. Does he/she play with objects taking them in and out of a container?	VMC, VP
18. Does he/she point to people, objects, or drawings that interest him/her?	VMC, VP
19. Does he/she know where things that interest him are kept at home, as his toys, books, clothing, or food?	VMC, VP
20. Does your child scribble with a pencil or a pen on paper?	VMC, VP
21. Does he/she imitate painting some strokes?	VMC, VP
22. Does he/she know where his/her hands, ears, mouth, eyes, … are?	VMC, VP
23. Does he/she recognize familiar objects or people?	VP
24. Does your child react in advance to common situations, such as knowing he/she will eat or go to the street when he/she sees the baby trolley?	VP
25. Does he/she look at a known person if named?	VP
26. Does he/she look for what turn things on like a toy switch, light switch, …?	VP
27. Does he/she recognize himself in a photo?	VP
28. Does he/she identify several drawings (like animals, a house, …)?	VP
29. Does he/she know what two things are similar?	VP
30. Is your child interested in making a simple puzzle?	VP

Domain	Questions
VA	1 2 3 4 5 6 7 8 9 10 11
VC	10 12 13 14 15
VMC	4 5 6 7 8 9 16 17 18 19 20 21 22
VP	6 8 9 11 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

VA: visual attention; VC: visual communication; VMC: visual-motor coordination; VP: visual processing.

diseases, who presented to Ankara Bilkent City Hospital for routine vaccinations. The study included infants who were divided into age groups of 0-1 month, 1-2 months, 2-4 months, 4-6 months, 6-9 months, 9-12 months, 12-18 months, and 18-24 months. Participants were recruited between October 2021 and September 2022 in the capital city of Turkey.

This study was conducted with permission from the developers of the PreViAs questionnaire, in accordance with the ethical guidelines established by the Declaration of Helsinki, and it was approved by the Ankara Bilkent City Hospital Clinical Research Ethics Committee (Protocol number: E2-21-249). Written consent was obtained from all parents before data collection.

Statistical analysis: The sample size was determined to be a minimum of 246 participants using the confidence interval equation for a 95% confidence level and a 5% margin of error. All statistical analyses were performed using the IBM SPSS Statistics 25 package. In descriptive statistics, mean and standard deviation values were defined for continuous variables, and frequency-ratio values were defined for categorical variables. The internal consistency of the scores for the global and all domains were determined using Cronbach's alpha.

RESULTS

In this study, a total of 390 infants and their parents were invited to participate in the study, but 112 infants were excluded due to a history of premature birth or congenital eye disease. Therefore, 278 infants were included in the final analysis, consisting of 156 (56.1%) boys. The infants included in the study were born between 37 and 42 weeks, with birth weights ranging from 2000 to 4800 grams. The age of the infants ranged from 0 to 24 months, with a median age of 139 days (*Table 2*).

The internal consistency analysis showed Cronbach's alpha value of 0.958 for the total score, indicating high consistency. For each domain, the Cronbach's alpha values were 0.890 for VA, 0.913 for VC, 0.951 for VP, and 0.922 for VMC, indicating good consistency. Please refer to *Table 3* for the detailed results. *Table 4* presents the mean scores and cut-off scores for each age group of the PreViAs questionnaire.

Table 2. Clinical characteristics of the infants (n = 278)

Variable	
Gender (n, %)	Male 156 (56.1)
Chronological age, days (median, range)	139 (2-736)
Gestational age, weeks (median, range)	39 (37-42)
Birth weight, grams (median, range)	3300 (2000-4800)

Table 3. The internal consistency of the PreViAs questionnaire by Cronbach's alpha

	Item No	Items n	Cronbach's alpha value
Total	All items	30	0.958
VA	First 11 items	11	0.890
VC	10, 12, 13, 14, 15	5	0.913
VMC	4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 22	13	0.922
VP	6, 8, 9, 11, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30	20	0.951

VA: visual attention; VC: visual communication; VMC: visual-motor coordination; VP: visual processing.

Table 4. The mean score and cutoff score of the PreViAs questionnaire for each age group

	0-1 months (N = 43)	1-2 months (N = 24)	2-4 months (N = 34)	4-6 months (N = 38)	6-9 months (N = 33)	9-12 months (N = 33)	12-18 months (N = 43)	18-24 months (N = 30)
Total score								
Mean (SD)	3.14 (1.81)	6.50 (2.67)	9.21 (2.82)	12.61 (3.85)	18.97 (4.94)	20.76 (4.64)	22.63 (5.79)	25.63 (4.88)
Mean - 2SD	-	1.16	3.57	4.91	9.09	11.48	11.05	15.87
VA								
Mean (SD)	3.02 (1.82)	5.75 (2.15)	7.68 (2.03)	9.13 (1.88)	10.21 (1.54)	10.55 (0.94)	10.42 (1.42)	10.30 (1.18)
Mean - 2SD	-	1.45	3.62	5.37	7.13	8.67	7.58	7.94
VC								
Mean (SD)	0.12 (0.39)	0.96 (1.52)	1.47 (1.28)	2.71 (1.49)	4.42 (1.00)	4.79 (0.89)	4.58 (1.16)	4.80 (0.66)
Mean - 2SD	-	-	-	-	2.42	3.01	2.26	3.48
VMC								
Mean (SD)	1.16 (1.04)	3.08 (1.67)	4.91 (1.71)	6.18 (2.06)	9.21 (2.57)	10.36 (1.95)	10.95 (2.60)	11.60 (2.04)
Mean - 2SD	-	-	1.49	2.06	4.07	6.46	5.75	7.52
VP								
Mean (SD)	0.40 (0.49)	1.67 (1.20)	3.03 (1.47)	4.89 (2.62)	9.70 (4.16)	11.12 (4.04)	13.19 (4.70)	16.27 (4.27)
Mean - 2SD	-	-	0.09	-	1.38	3.04	3.79	7.73

SD: standard deviation; VA: visual attention; VC: visual communication; VMC: visual-motor coordination; VP: visual processing.

DISCUSSION

Visual impairments, both ocular and cerebral, have been shown to have negative effects on neurocognitive development and cognitive function in childhood, and this issue represents a global health problem that can impair overall well-being.[13] In response to this, the VISION 2020 program was launched in 1999 by the World Health Organization and the International Agency for the Prevention of Blindness, with the goal of eliminating preventable blindness worldwide by the year 2020.[1,14] The program emphasizes the importance of primary eye care in childhood, including awareness and attention to vision screening as a fundamental practice for early detection and prevention of visual impairments. Revised pediatric eye screening guidelines emphasize the importance of identifying risk factors for visual impairment and red reflex testing, pupillary examination, assessment of fixation and following behavior, as well as external examination of the eye in children under the age of one. Instrumental examinations such as photo screening or autorefraction may be recommended for screening after the age of 1 year. However, in infants who cannot pass the screening tests or are at risk of low vision, there is an indication for a comprehensive examination to identify reasons that cannot be detected through screening tests.[15]

Some vision screening methods and tools can be applied by trained laypersons, including families, and early diagnosis is critical for effective intervention. Questionnaires are a method commonly used to evaluate visual functions and their impact on quality of life in childhood. These questionnaires are often focused on specific eye diseases, low vision, or overall quality of life. In the literature review, it is evident that questionnaires aimed at assessing childhood visual behaviors are typically developed for school-aged and young children.[16-18] The PreViAs questionnaire utilized in our study is validated for assessing vision in the preverbal period and has been used to evaluate the visual functions of infants under 24 months of age.[11,12] We chose to use the PreViAs questionnaire in our study because it is a straightforward method for measuring visual functions in early childhood.

The English version of PreViAs, which has been developed in Spanish and published in English, has been used in studies evaluating visual development in healthy, full-term preverbal infants[19] and in comparisons of vision between preterm and term infants.[20] PreViAs has also been used as an assessment tool to detect early visual behavioral problems in very preterm infants with the presence of micro and macrostructural brain difficulties.[21] By adapting the questionnaire to Turkish and demonstrating its reliability, we have contributed to its potential widespread use around the world in the future.

The infant groups in our study differ from those in other studies. Pueyo et al. determined their groups at 2-month intervals until the first 6 months, and then at 3-month intervals, while Kim et al. formed groups at 6-month intervals.[11,19] These studies show that visual functions that increase with age in infancy are also reflected in PreViAs scores. In our study, we classified the first 6 months of rapid vision development with shorter intervals to emphasize the neonatal period, which differed from both studies. We examined the 6-12 month period, during which functional vision develops, at 3-month intervals, and the relatively stable 12-24 month period in healthy children at 6-month intervals. Our grouping was found to be appropriate for evaluating functional vision, as the results in these age groups were similar to those reported in the literature.

Standard practice involves following up on the visual function of preterm and term babies during infancy or school age. However, functional visual assessment is not commonly performed during the neonatal period.[22,23] Studies evaluating vision during this time have tended to use black and white stripes[24] and visual evoked potential measurements.[25] In recent years, studies on visual function in the neonatal period have evolved due to the rise of cerebral visual impairment as the leading cause of low vision.[26] Different tools are used, particularly in preterm infants, infants with cerebral palsy risk[27], and newborns with neurological risks.[28] Our study's separate grouping of the neonatal period aims to emphasize the questionnaire's usability for this age group. The widespread use of easy methods such as PreViAs in newborn follow-up may increase awareness of newborns' visual functioning.

One limitation of this study is its reliance solely on parent-reported data. Future studies should include a direct evaluation for a more comprehensive assessment of PreViAs psychometric properties and structure. While the reliability of the PreViAs questionnaire has been found to be acceptable in both our study and previous research, validity analysis such as confirmatory factor analysis cannot be performed

due to the presence of too many common items across domains. Thus, future investigations may focus on evaluating the criterion-reference validity of the PreViAs questionnaire.

CONCLUSION

To achieve early diagnosis and intervention for preventable causes of low vision and blindness during the preverbal period, it is essential to utilize vision screening methods with proven effectiveness and conduct comprehensive ophthalmological examinations when indicated. The use of the Turkish version of PreViAs as a valid method to objectively evaluate infants' functional vision, together with new studies in different populations, may strengthen the acceptance of this questionnaire as a new vision screening approach and its use in combination with other techniques and ophthalmological assessments. ■

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