

Psychometric Properties of The Turkish Version of The Knowledge of Infant Development Inventory

Bebek Gelişim Bilgisi Envanterinin Türkçe Versiyonunun Psikometrik Özellikleri

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ABSTRACT

Objective: This study aimed to adapt the Knowledge of Infant Development Inventory (KIDI) into Turkish and to evaluate its validity and reliability among parents of children aged 0–2 years.

Methods: A methodological design was employed with 464 parents. The KIDI was translated into Turkish and The Content Validity Index and Content Validity Ratio were used to get opinions from the experts. The KIDI was analyzed using two scoring approaches. In the first, responses were categorized as accurate, attempted, underestimated, or overestimated, following original format. In the second approach, items were scored dichotomously as correct (1) or incorrect (0). Validity was assessed through exploratory factor analysis (EFA), concurrent validity using Spearman correlation with the CKCDI, and construct validity via tetrachoric EFA and Rasch modeling. Reliability was evaluated with Cronbach's alpha (both classical and tetrachoric), test-retest, and item discrimination analysis.

Results: Content validity was confirmed (CVI = 1.00), and EFA supported a four-factor structure consistent with the original scale, explaining 57.94% of the variance. The scale showed strong concurrent validity with CKCDI ($r = .908, P < .001$). In the dichotomous analysis, tetrachoric EFA and Rasch modeling indicated acceptable structural validity and item fit (infit/outfit range: 0.7–1.3). Cronbach's alpha was 0.81 (tetrachoric), and the 27% upper-lower group comparison revealed strong item discrimination.

Conclusion: The Turkish version of the KIDI was found to be a valid and reliable instrument for parent. Professionals can use this scale to assess parents' understanding of infant developmental milestones and norms.

Keywords: Parental knowledge, infant development, infant development knowledge, reliability, validity

ÖZ

Amaç: Bu çalışmanın amacı, Bebek Gelişimi Bilgi Envanteri'ni (BGBE) Türkçe'ye uyarlamak ve 0-2 yaş arası çocukların ebeveynleri arasında geçerlik ve güvenilirliğini değerlendirmektir.

Yöntemler: Araştırma, yöntemsel bir desenle ve 464 ebeveyn ile gerçekleştirilmiştir. BGBE Türkçe'ye çevrilmiş ve uzmanlardan görüş almak için İçerik Geçerlilik İndeksi ve İçerik Geçerlilik Oranı kullanılmıştır. Ölçek iki farklı puanlama yöntemiyle analiz edilmiştir. İlk yöntemde yanıtlar doğru, emin değilim, aşırı tahmin ve düşük tahmin şeklinde sınıflandırılmıştır. İkinci yöntemde ise maddeler doğru (1) ve yanlış (0) olarak kodlanmış ve dikotomik analizler uygulanmıştır. Geçerlilik, açıklayıcı faktör analizi (AFA), ölçek ile Spearman korelasyonu kullanılarak eş zamanlı geçerlilik ve tetrakorik AFA ve Rasch modellemesi yoluyla yapı geçerliliği ile değerlendirilmiştir. Güvenilirlik Cronbach alfa (hem klasik hem de tetrakorik), test-tekrar test ve %27'lik grup ayırt edicilik analizi ile değerlendirilmiştir.

Bulgular: Kapsam geçerliliği teyit edilmiş ve AFA orijinal ölçekle tutarlı dört faktörlü bir yapıyı destekleyerek varyansın %57,94'ünü açıklamıştır. Ölçek, CKCDI ile güçlü eşzamanlı geçerlilik göstermiştir ($r = ,908, P < ,001$). Dikotom analizde, tetrakorik AFA ve Rasch modellemesi kabul edilebilir yapısal geçerlilik ve madde uyumu göstermiştir (0,7-1,3). Cronbach alfa değeri 0,81'dir (tetrakorik) ve %27'lik üst-alt grup karşılaştırması güçlü madde ayırt ediciliği ortaya koymuştur.

Sonuç: BGBE'nin Türkçe versiyonu ebeveynler için geçerli ve güvenilir bir araç olarak bulunmuştur. Profesyoneller, bu ölçeği ebeveynlerin bebeklerinin gelişimsel basamakları ve normları konusundaki bilgi ve anlayış düzeylerini değerlendirmek amacıyla kullanabilirler.

Anahtar Kelimeler: Ebeveyn bilgisi, bebek gelişimi, bebek gelişim bilgisi, güvenilirlik, geçerlilik

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INTRODUCTION

Knowledge about the developmental milestones of infants/children greatly influences how adequately and safely caregivers raise and interact with them. When studies in literature are examined, it is seen that parents' knowledge of child development has a positive effect on supporting their children's growth. Researchers have suggested that parents who are knowledgeable about their children's development are more responsive to their children's needs and use effective parenting methods to support their cognitive well-being.¹⁻⁴ Many professionals, such as nurses, social services specialist, child development specialists and teachers, need inventories to assess parents' knowledge of infant development and to provide support to parents following this assessment. However, in Türkiye, there is a lack of a comprehensive, valid and reliable measurement tool that can objectively assess not only mothers but also fathers' level of knowledge on infant development. This situation creates an important gap in terms of early identification of families at risk, targeted intervention planning and development of public policies. The lack of such a tool leads to the inability of health professionals, social services specialists and child development specialists to systematically and objectively assess parents' level of knowledge. This may result in inadequate individualization of parental education, delayed recognition of developmental delays, increased family stress, neglect of children's early health, safety and developmental needs, and indirect long-term economic burden on the education and health system.⁵⁻⁷ Given the critical role of parental knowledge in supporting child development, the development and application of psychometrically robust instruments to assess this knowledge are essential. Such tools have the potential to enhance the efficacy of early intervention programs, strengthen familial relationships, and foster the healthy development of children. In response to the need for standardized assessment at the international level, the Knowledge of Infant Development Inventory (KIDI) was developed and has been widely employed, with its validity and reliability demonstrated across various linguistic and cultural contexts.⁸ This is a scale widely used in many countries to assess parenting knowledge. It is commonly used to evaluate a parent's or caregiver's understanding of parenting practices, developmental processes, health and safety guidelines, as well as norms and milestones related to children's growth from birth to 2 years of age. The KIDI is based on a professionally established knowledge criterion, as each item in the inventory targets information that pediatricians believe all parents should know. Thus,

the tool measures a professional knowledge standard, minimizing subjectivity and the influence of culture. Furthermore, KIDI can be used as a screening tool to identify parents who may be at high risk or as a program evaluation tool for parent education programs. For this reason, it is planned to translate the KIDI into Turkish, conduct validity and reliability tests, and include it in the literature. In general, the KIDI has been translated into many languages such as Portuguese (Portugal and Brazil), Korean, Spanish, Polish, Vietnamese, and Arabic has been used in studies.⁹⁻¹⁴ There are also studies in which the KIDI was used as the basis for developing scales to measure parents' knowledge of their infants/children's development.^{15,16} In Türkiye, there is a need for comprehensive, easy-to-administer, reliable measurement tools for infants that can be used by all specialists working with children and that will enable the creation of appropriate intervention practices based on the evaluation results. The main aim of this study was to perform validity and reliability analyses of the Turkish version of the KIDI in order to assess the level of knowledge of parents with children aged 0-2 years about infant development. In this context, the study aims to provide experts working with children and their parents in Türkiye with a measurement tool that can objectively, validly and reliably assess parents' level of knowledge. It is also expected to contribute to the creation of a data-driven evaluation infrastructure that will support early intervention processes.

AIM

The study also aims to bring the Turkish example to the literature on the multicultural validity of the KIDI and to carry the psychometric findings specific to the Turkish context to the international arena.

Research questions

- Is the Turkish version of the Knowledge of Infant Development Inventory (KIDI) a valid and reliable instrument for assessing the knowledge of infant development among parents of 0–2-year-old children?

METHODS

Study Design and Participants

The study is a methodological study conducted to determine the validity and reliability of the KIDI adapted into Turkish. The study group of the research consisted of 246 mothers and 218 fathers residing in Eskişehir province and having babies between the ages of 0-2 years, totaling 464 parents. In determining the sample size for the construct validity study, the formula of at least five

times the number of items of the scales was applied. It was planned to reach at least 290 (58 items x 5) parents for the KIDI.¹⁷ Interviews were conducted with 1200 parents and data were collected from 464 parents who answered all the questions voluntarily. The inclusion criteria were being a parent with a baby aged 0-2 years and participating in the study voluntarily. Data were collected between January and December 2023. The scale was answered by the parents in 25-35 minutes. All answers were obtained face-to-face.

Demographic information was shown in Table 1. Mothers were generally between 26-29 years old (32.9%), and fathers were usually between 30-35 years old (42.2%). The education level of both groups was mostly high school (M-37.4% & F-40.8%). They mostly had only one child (57.2%). The gender of the parents' babies was 54.4% female and 45.6% male. 34% of these babies were between 0-5 months, 38.3% between 6-12 months, 12.3% between 13-18 months and 15.5% between 19-24 months.

Table 1. Demographic Information on Mothers and Fathers

	Mother		Father	
	n	%	n	%
Parent	246	53.1	218	46.9
Parents' Age				
18-25	64	26.0	16	7.3
26-29	81	32.9	56	25.7
30-35	70	28.5	92	42.2
36-48	31	12.6	53	24.3
Parent's Education Level				
Primary school	9	3.7	9	4.1
Middle school	20	8.1	22	10.1
High school	92	37.4	89	40.8
Associate degree	48	19.5	23	10.6
Bachelor's degree	72	29.3	69	31.7
Postgraduate	5	2.0	6	2.8
Babies	n	%		
Baby's gender				
Girl	253	54.4		
Boy	212	45.6		
Babies' month group				
0-5	158	34.0		
6-12	178	38.3		
13-18	57	12.3		
19-24	72	15.5		
Number of children				
1	266	57.2		
2	148	31.8		
3	39	8.4		
More than 3	12	2.6		

Data Collection Tool

The Knowledge of Infant Development Inventory (KIDI) was developed by David MacPhee in 1981 and revised in 2002.⁸ It was created to assess a parent's knowledge of parenting

practices, infant development processes, and behavioral norms of an infant aged 0-2 years. The scale contains 4 subscales, namely: Principles (items: 3, 10, 11, 14, 16, 18, 21, 24, 26, 27, 29, 30, 32, 33, and 37), Parenting (items: 1, 4, 7, 12, 13, 28, 35, 38, and 39), Health and safety (items: 5, 8, 15, 19, 20, 22, 25, 31, 34, and 36), and Norms and milestones (items: 2, 6, 9, 23, 17, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, and 58). Responses to items 1-39 are scored as true, false or not sure. Correct answers consist of information from the literature. In the second section (items 40-58), which deals with the baby's developmental milestones, if the parent disagrees with the accuracy of the item, he/she marks that the relevant item can be done by a younger or older baby (Figure 1). Three final scores are calculated (expectation, consistency with expectation and total) reflecting accuracy and confidence in parental knowledge.

	Agree	Disagree	Not Sure
1. When toddlers are strongly attached (bonded) to their parents, they are more clingy and tend to stick close to mom or dad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. A 2 year old who is 2 or 3 months behind other 2 year olds is developmentally delayed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Agree	Younger	Older	Not Sure
40. Most babies can sit on the floor without falling over by 7 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
41. Six month olds will respond to someone differently if the person is happy or upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
42. Most 2 year olds know the difference between make-believe and true stories on TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 1. Sample Items from The KIDI Scale

The KIDI, as developed by MacPhee, categorizes responses into four types: accurate, attempted, underestimated, and overestimated. Accurate responses are those in which the respondent correctly identifies the information aligned with established developmental knowledge. Attempted responses refer to instances where the respondent selects "not sure," indicating uncertainty rather than misinformation. The categories of underestimated and overestimated responses are specifically applied to items 40 through 58, which assess the respondent's perception of developmental milestones in relation to age norms. Incorrect answers in this section suggest that the respondent either overestimates or underestimates children's capabilities at specific developmental stages. Another way of scoring the KIDI is the zero-one system. Each correct answer is marked as 1 and each incorrect answer as 0. "Not sure" answers are assumed as lack of knowledge (0). Generally, the 0-1 scoring system is used in research.^{10,12}

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In this study, the KIDI was evaluated using two distinct scoring approaches. The first approach followed the original conceptualization by MacPhee, which classifies responses as accurate, attempted, underestimated, or overestimated. This method captures not only the correctness of responses but also the degree of uncertainty or developmental misjudgment, particularly within items assessing age-appropriate expectations (items 40–58). The second scoring approach treated the KIDI as a dichotomous knowledge test, coding responses as 1 (correct) and 0 (incorrect).

Statistical Analysis

Translation and retranslation methods were used to test language validity. The measurement tool was translated from English into Turkish by two independent foreign language experts. It was sent to two Turkish language experts to determine the comprehensibility of the expressions in the translation and their suitability to the structure of the Turkish language. The opinions of 3 child development experts were obtained regarding the suitability of the language translation of the items to the field. The Turkish form was reverse translated by a foreign language expert who had not seen the original version before. The obtained reverse translation and the items in the original scale form were evaluated for equivalence by 2 foreign language experts. It was accepted by 2 foreign language experts that the translation did not create a semantic difference and the items were equivalent. The translation was piloted with 10 mothers and 10 fathers who voluntarily agreed to give their opinions to evaluate its comprehensibility by the study group. After the pilot study, it was learned that the items were comprehensible by the parents in the study group. Finally, the final version of the inventory was created.

The Lawshe technique was used to evaluate the content validity of the scales. With the Lawshe technique, content validity should be evaluated by at least 5 and at most 40 experts.¹⁸ Content validity ratios (CVR) are obtained by minus one of the ratio of the number of experts who marked the item as "Required" to the total number of experts who expressed an opinion on the item.¹⁹ For content validity, five experts were asked to evaluate the items of the scale as "Appropriate" and "Not Appropriate" developmentally and culturally. First, a group of child development experts was formed. The final version of the inventory was sent to five experts. The content validity rates were obtained for the items. Content validity index was obtained for the whole inventory. The minimum values (content validity criteria) determined by Veneziano and Hooper were taken as criteria.²⁰ Therefore, since the number of experts in this study was five, 0.99 was taken as a criterion. The content validity ratios of all items were above the 0.99 criterion and were therefore considered significant. Accordingly, it was concluded that the content validity index for the overall test was 1 and all items were appropriate for the developmental and cultural structure. The final version of the form was created according to the content validity ratios/validity index criteria.

In this study, the KIDI was evaluated using two distinct scoring approaches. The first approach was based on the framework proposed by MacPhee, in which responses to the KIDI items are categorized as "accurate," "attempted" (i.e., not sure), "underestimated," or "overestimated." Within this framework, content validity ratios (CVR) were examined, the adequacy of the sample was assessed using the Kaiser-Meyer-Olkin (KMO) measure, and the factorability of the data was assessed with Bartlett's Test of Sphericity. For concurrent validity, Spearman correlation analysis was conducted to examine relationships between the KIDI and related measures. Reliability was evaluated using Cronbach's alpha coefficient, while group differences were analyzed using Hotelling's T-Squared test, the Mann-Whitney U test for pairwise comparisons, and the Kruskal-Wallis test for multiple group comparisons. A significance level of $P < .05$ was used in all statistical tests. The second analytical approach involved scoring the KCDI items in a dichotomous format, with responses coded as 0 (incorrect) and 1 (correct), aligning the analysis with a knowledge-test framework. Accordingly, construct validity and item discrimination were evaluated using exploratory factor analysis based on a tetrachoric correlation matrix and the Rasch model, both of which are appropriate for dichotomous data. In addition, the internal consistency of

the scale was assessed using Cronbach's alpha based on tetrachoric correlations, and item selectivity was tested through a 27% upper-lower group discrimination analysis. All statistical analyses were performed using IBM SPSS Statistics for Windows Version 26.0, Jamovi Version 2.3, and R software Version 4.3.2. Exploratory factor analyses (EFA) were conducted using both SPSS and Jamovi. Confirmatory factor analysis (CFA) was conducted using Jamovi (SEM module), and model fit indices (e.g., RMSEA, CFI, TLI, χ^2/df) were assessed to evaluate the fit of the proposed factor structure. Tetrachoric correlation-based factor analyses and Rasch model analyses were performed in Jamovi and R using the psych and TAM packages. Reliability analyses, including Cronbach's alpha based on Pearson and tetrachoric correlations, as well as upper-lower 27% group discrimination analysis, were carried out using SPSS and R.

Ethical Considerations

To start the validity and reliability study of The KIDI, the necessary permission for use was first obtained from the researcher who developed the scale on November 10, 2022. Ethics committee approval was received for this study from the ethics committee of Anadolu University (Approval Number: 42/54, Approval Date: 27/12/2022). Parents were informed about the study, and it was emphasized that they could withdraw from the study at any time. Some parents did not want to participate in the study due to time constraints. Some participants also left some questions incomplete. Incomplete forms were not included in the data set. All participants were assured of anonymity and confidentiality. Written informed consent was obtained from those who volunteered to participate in the study.

RESULTS

Validity

In the first analytical approach, which followed a classical factor analysis method, the adequacy of the sample size was assessed using the Kaiser-Meyer-Olkin (KMO) measure (0.63), indicating moderate suitability for factor analysis. Bartlett's Test of Sphericity was significant ($\chi^2 = 3951$, $df = 1653$, $P < .001$), supporting the factorability of the correlation matrix. Exploratory factor analysis (EFA) based on Pearson correlations revealed four factors with eigenvalues greater than 1 (4.028, 3.290, 2.603, and 1.032), collectively explaining approximately 57.94% of the total variance. The Scree Plot further supported the four-factor solution, indicating a clear inflection point after the fourth factor. Model fit indices indicated that the extracted factor structure provided an acceptable fit to the data. Specifically, the Root Mean Square Error of Approximation

(RMSEA) was 0.0249, with a 90% confidence interval ranging from 0.0210 to 0.0287, suggesting a close fit of the model. The Tucker-Lewis Index (TLI) was 0.787, reflecting moderate model fit. Additionally, the chi-square goodness-of-fit statistic was significant ($\chi^2 = 1378$, $df = 1070$, $P < .001$), which was common in large sample sizes and supports the conclusion that the model structure was statistically supported.

In a second analytical approach, suitable for dichotomous data, tetrachoric correlation-based EFA and Rasch modeling were employed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.65, indicating moderate but acceptable suitability for factor analysis. Bartlett's Test of Sphericity was statistically significant ($\chi^2 = 4494$, $df = 1653$, $P < .001$), supporting the factorability of the data. Based on eigenvalues greater than 1, four factors were extracted with initial eigenvalues of 3.36, 2.37, 1.63, and 1.11, collectively accounting for 15.50% of the total variance. The Root Mean Square Error of Approximation (RMSEA) was 0.0361 with 90% confidence interval ranging from 0.0334 to 0.0389, indicating a good model fit. The Tucker-Lewis Index (TLI) was 0.644, suggesting moderate model fit. The tetrachoric EFA indicated that the items loaded onto four theoretical subdimensions consistent with the original structure. Factor extraction was based on eigenvalues greater than 1, and Varimax rotation was applied. Factor loadings exceeding 0.30 provided strong evidence for construct validity. To assess item discrimination and model fit, a Rasch analysis was conducted. Model fit statistics indicated acceptable alignment with the Rasch model (Person Reliability = 0.703; MADaQ3 = 0.0633, $P < .001$). The majority of item infit and outfit values were between 0.7 and 1.3, supporting model compatibility. For example, item 1 had a correct response rate of 8.2% and a difficulty estimate (measure) of 2.51, indicating it was among the more difficult items. Item difficulty was distributed across a broad range, supporting the instrument's capability to distinguish between varying levels of parental knowledge. To further assess item discrimination, a 27% upper-lower group comparison was conducted. Participants were ranked by their total scores, and the top 27% (high knowledge group) and bottom 27% (low knowledge group) were compared for each item. For instance, item s4 showed a difference of 0.38 (upper group = 0.78, lower group = 0.40), reflecting a high level of discrimination. However, some items, such as s1 (difference = 0.12), exhibited relatively lower discrimination. Between 0.20-0.39 was considered as Moderate discrimination and less than 0.20 was considered as Low discrimination (revisable). Differences in correct response rates between the groups exceeded 0.20 for the

majority of items, indicating moderate item discrimination.

To test the concurrent validity of the KIDI, 100 parents were additionally asked to complete the Caregiver Knowledge of Child Development Inventory (CKCDI). Caregiver Knowledge of Child Development Inventory (CKCDI) was developed by Ertem et al.¹⁶ The internal consistency of the scale consisting of a total of 20 items was found to be 0.61. The scale was developed to measure the knowledge of mothers with children aged 0-3 years about infancy and early childhood development and developmental support. Ten of the questions in the scale are related to developmental skills and 10 questions are related to stimuli to support developmental skills. In scoring, if the answer given by the caregiver is within the correct age range, he/she receives two points, if it is one month above or below the correct age range, he/she receives one point, and if it is outside the age range, he/she receives zero points. The highest score that can be achieved on the scale is 40. A high score on the scale suggests that mothers have a high level of knowledge about child development, while a low score suggests that mothers have a low level of knowledge about child development. For concurrent validity, the correlations between the scores of the Infant Developmental Knowledge Inventory and the scores of the Families' Developmental Knowledge Scale were examined. Spearman's rho was used because it did not show a normal distribution. As a result of the analysis, Spearman's correlation coefficient $r=.908$ and $P=.001$.

Reliability Analysis

To test the reliability of the KIDI, the Cronbach alpha internal consistency coefficient was examined and the result was 0.75. Another study conducted to determine the reliability of the assessment tool was the Test-Retest Reliability calculation. Five weeks after the original application of the scale, a reapplication was conducted with 30 (mothers $N=20$ and fathers $N=10$) who took part in the first application. As a result of the application, the Spearman Correlation coefficient between the total scores obtained from the scale was found to be 0.948 ($P<.001$).

The summability of the responses to the scale items was evaluated with the Tukey summability test (Table 2). Each item of the scale should be a linear component of the total score. For this reason, the answers to the questions should be summable. When the summability analysis values in the table above are examined, it was seen that the significance level of the relevant values is $P<.05$. The Hotelling's T-Squared =11931.706 and $P=.001$ results strongly indicate that the difference between the groups was statistically very significant.

Table 2. The Tukey Summability Test

	Sum of Squares	df	Mean Square	F	P
Between People	281.734	464	0.608		
Between Items	1251.731	57	21.960	121.634	<.001
Nonadditivity Residual	1.881	1	1.881	10.422	.001
(Within People)	4762.853	26390	0.180		
Total	6298.199	26911	0.234		

The reliability of the KIDI was examined using tetrachoric correlations-based Cronbach's alpha, due to the dichotomous nature of the items (coded as 0 = incorrect, 1 = correct). The overall internal consistency was found to be good ($\alpha = 0.81$), indicating that the items are coherently measuring a common underlying construct (Table 3). The reliability values were consistent across items, and most items demonstrated acceptable item-total correlations.

Table 3. Internal Consistency and Related Statistics Based on Tetrachoric Correlations

α	Standardized Alpha	G6	Average Inter-item r	S/N	Ase	Median Inter-item r
0.81	0.81	0.94	0.067	4.2	0.013	0.065

Note: α = Cronbach's Alpha; G6 = Guttman's lambda-6; r = correlation; S/N = signal-to-noise ratio; ASE = average standard error.

Reliability confidence intervals (Feldt: 0.73–0.87) further confirmed the scale's robustness (Table 4). Although a few items (e.g., s30, s31, s54) showed relatively lower discrimination, the overall reliability of the scale was strong.

Table 4. 95% confidence intervals for Cronbach's alpha

	95% confidence boundaries		
	lower	alpha	upper
Feldt	0.73	0.81	0.87
Duhachek	0.78	0.81	0.83

Note: Alpha = Cronbach's reliability coefficient; Confidence intervals provide a range within which the true reliability is expected to fall, with 95% certainty.

Relationship with KIDI Score and Sociodemographic Factors

When the average correct scores of infant development knowledge of the mothers and fathers participating in the study are evaluated, the mothers scored 64.15%, and the fathers 60.94%. The analysis of the infant development knowledge scores of the mothers and fathers participating in the study is given in Table 5.

The results showed that there is a statistically significant difference between the infant development knowledge

Table 5. Distribution of Infant Development Knowledge Scores According to Parents

Parent	N	MR	Sum of Ranks	U	P
Mother	246	250.08	61520.50	22488.500	.003
Father	218	212.66	46359.50		

MR, Mean Rank; N, Number; U, Mann Whitney U; P, value

scores of the mothers and fathers ($P < .05$). In the study, it was found that the infant development knowledge of the mothers was higher than that of the fathers. There was no statistically significant difference between the infant development knowledge scores of the parents depending on the gender of their babies ($U = 24725.500$, $P > .05$), the age of the parents ($\chi^2 = 5.010$, $sd = 3$, $P = .171$), the number of children the parents had ($\chi^2 = 2.857$, $sd = 3$, $P = .414$). However, a significant difference was found according to the educational level of the parents ($\chi^2 = 18.093$, $sd = 5$, $P = .003$). In particular, it was observed that parents with associate, undergraduate, and graduate education levels had higher infant development knowledge compared to other parents.

DISCUSSION

It was concluded that the content validity index of KIDI was 1 and all items were appropriate for developmental and cultural structure. According to the exploratory factor analysis, 4 dimensions with eigenvalues above 1 were found and this result was consistent with the number of dimensions in the original scale. The factors explained approximately 57.94% of the total variance. The concurrent validity study showed that the KIDI had a highly significant positive correlation with the CKCDI ($r = .908$) at the .001 level according to the Spearman Correlation coefficient.²¹ In line with the results, it was revealed that it was a valid scale for Turkish parents. The original inventory was answered by parents in 30–45 minutes. In Turkish parents, the response time was between 25 and 35 minutes. In the second analytical approach, the KIDI was treated as a dichotomous knowledge scale, with items scored as either correct or incorrect. This method allowed for the use of analytical techniques appropriate for binary data. The construct validity of the dichotomously scored scale was supported through exploratory factor analysis based on tetrachoric correlations, which identified four factors in line with the theoretical structure of the original instrument. Although the total explained variance was modest which is as is typical in dichotomous item analysis, the factor loadings above 0.30 and model fit indices (e.g., RMSEA = 0.02, TLI = 0.78) indicated acceptable model fit.²² Although the explained variance was relatively low, this is expected in EFA using dichotomous items and is consistent

with similar scale structures in developmental research.²³ Additionally, Rasch analysis further confirmed the structural validity of the scale. The majority of items demonstrated acceptable infit and outfit statistics (within the 0.7–1.3 range), and item difficulty estimates covered a wide range, indicating that the scale effectively discriminates among parents with varying levels of knowledge.²⁴ The person reliability index (0.703) also supported the scale's ability to distinguish different levels of the trait being measured. Furthermore, the analysis revealed that for the majority of items, the difference in correct response rates between the upper and lower groups exceeded 0.20, indicating acceptable to strong item discrimination.²⁵ Taken together, the results from the second approach demonstrate that the Turkish version of the KIDI, when evaluated through dichotomous scoring, possesses robust psychometric properties and can serve as a valid tool for assessing parental knowledge in the Turkish context.

The Cronbach alpha internal consistency coefficient of the scale was found to be 0.75. The internal consistency of the KIDI has been reported to range between 0.80 and 0.86 in many studies.⁸ It was quite similar to the internal consistency of the original version of the scale. The Spearman's rho value of 0.948 ($P < .00$) between the total scores of the test-retest reliability was found to be a strong positive significant relationship.²¹ In line with the Tukey summability test analysis, it can be said that the responses to the items have summability (Table 2). Hostelling's T-squared (11931.706 and $P = .001$) indicates that there are significant differences between the groups, that these differences are not random, that they did not give a biased response, and that they perceived the items in the same way.²⁶ In terms of reliability, the dichotomously scored version of the KIDI demonstrated strong internal consistency. Cronbach's alpha, computed using a tetrachoric correlation matrix, was found to be 0.81, indicating a high level of internal reliability suitable for knowledge-based measurement tools. This value exceeds the commonly accepted threshold of 0.70 for psychological scales and is consistent with findings from prior adaptations of the instrument.²⁷ The average item-total correlation was 0.067, and although a few items (e.g., s30, s31, s54) exhibited relatively lower discrimination, the overall pattern confirmed the coherence of the scale. Additionally, the reliability confidence intervals calculated using the Feldt and Duhachek methods provided further support for the robustness of the scale. Feldt's 95% confidence interval ranged from 0.73 to 0.87, and Duhachek's interval ranged from 0.78 to 0.83, indicating that the true reliability of the scale remains consistently

within a strong range regardless of estimation method.²⁴ These findings support the interpretation that the KIDI, when scored dichotomously, offers reliable measurement of parental knowledge in a Turkish context. All analyses revealed that the KIDI can be used as a valid and reliable scale for Turkish mothers and fathers.

The mean infant development knowledge scores of the mothers and fathers participating in the study were analyzed and it was found that mothers had higher infant development knowledge than fathers. Correct answer rates are more than half for both groups. This shows that the knowledge of infant development in both groups as parents was above average. This suggests that fathers now play a greater role in infant care, follow the development of their babies more, and are therefore more aware. In a study conducted on fathers in Türkiye, it was found that they marked the option of following their baby's growth and development the most, but they participated the least in the physical care of their babies and the most in play activities.²⁸ It was found that parents' knowledge of infant development did not vary depending on the gender of the baby, the number of children they had, and the age of the parent. There are different results in the literature regarding the number of children. In a study conducted with mothers in Türkiye, it was observed that infant development knowledge decreased as the number of children they had increased. It was stated that the reason for this may be related to the mother's idea of having fewer children and allocating more time. However, the number of children should not be considered as a variable alone. Variables such as the environment in which parents live, culture, socioeconomic and educational status, and mental state may affect their knowledge of infant development.^{8,12,16} Although there was no relationship between the age of the parents and infant development knowledge, it was observed that the rate of correct answers increased as the age of the parents increased. Similarly, in a study conducted with Saudi Arabian mothers, it was found that infant development knowledge increased depending on the age of the mothers.¹³ Gondim et al.²⁹ also found that mothers gave fewer incorrect answers as their age increased.

It was found that parents' knowledge of infant development differed depending on their level of education. In studies conducted only with mothers.^{14,29-31} and in a study in which both parents participated¹³, it was observed that infant care knowledge increased as the education level of the caregiver increased. Unlike the results of this study, in another study conducted in Türkiye, it was concluded that the infant development knowledge

of mothers who read various sources was higher than that of mothers who did not read, but the educational level of the mothers and the number of children did not have an effect.³²

Implications for Pediatric Nursing and Child Development Specialist Practice

The Knowledge of Infant Development Inventory (KIDI) was shown to be a valid and reliable tool for Turkish parents in this study. However, the decision to use this inventory and implement interventions should take into account several factors. This inventory can provide valuable information about the level of infant developmental knowledge of parents (especially risky parents) and can guide the development of specific interventions aimed at empowerment. It includes the dimensions Principles, Parenting, Health and safety, Norms and milestones. The norms and milestones subscale includes items that describe the infant's typical behavior at a given time, such as motor, perceptual and cognitive. The principles subscale includes statements about developmental processes and definitions of normal and atypical development. The parenting subscale includes statements about parenting strategies, infant management through training or modeling, and beliefs about the responsibilities of being a parent. The health and safety subscale includes statements about the proper feeding and care of the infant, prevention of accidents and treatment of common illnesses. The expert can make an assessment for the sub-dimension they need. The expert can get a more detailed understanding of the areas where the parent is successful, and in this way, the deficiencies that need to be addressed can be identified in a shorter period of time. Thus, by supporting the parent during an important period such as infancy, worse neglect can be prevented. Early intervention in terms of community welfare can be provided in this way. In addition, it is important to consider the changes in the parent over time. In this way, the infant-parent interaction can be strengthened by affecting parental self-efficacy.

Parental infant development knowledge includes knowing the developmental norms of the child and following these processes, meeting basic needs, using child-rearing skills, and creating effective parenting strategies. Therefore, the assessment of parents' knowledge of infant development is assumed to be important for the development of their infants. There was a need to adapt "The Knowledge of Infant Development Inventory" (KIDI), which is widely used by many countries in Türkiye, for Turkish parents. The Knowledge of Infant Development Inventory (KIDI), which was developed to assess the infant development knowledge of mothers and

fathers with infants aged 0-2 years and to determine the risk levels related to parenting, was shown to be a valid and reliable tool in this study. The Turkish version of the KIDI consists of 4 subscales and 58 items. It was found to have a high Cronbach's α value consistent with the original. It was found to have similar characteristics with the Caregiver Knowledge of Child Development Inventory (CKCDI) in Turkish. It shows that it is a valid and reliable parent-report instrument that can be used to assess parents' knowledge of infant development in Türkiye.

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