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DEVELOPMENT OF A PARENTAL KNOWLEDGE SCALE FOR INHALATION PRACTICES

İNHALASYON UYGULAMALARINA YÖNELİK EBEVEYN BİLGİ ÖLÇEĞİNİN GELİŞTİRİLMESİ

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ABSTRACT

Objective: Develop a parental knowledge scale for inhalation practices and conduct a validity-reliability study.

Methods: A methodological study design was chosen. The research was carried out between February 2020 and June 2022 in the pediatric services of training-research hospitals in Erzurum. The study population consisted of parents with children aged 0-6 who received inhalation therapy in the pediatric services of the hospitals. The number of items on the scale was reached 9 times, and the sample of the study consisted of 390 parents. Frequency distribution, mean, standard deviation, minimum, maximum, KR-20 reliability coefficient, and Rasch analysis methods were used in the analysis of the data.

Results: The item dissociation index of the scale was 8.38, and the item reliability was 0.98. The person dissociation index was 1.99. In the Rasch model, the in-fit values ranged between 0.3-1.7. The average score of the participants from the scale is 27.25±6.21. The Parental Knowledge Scale for Inhalation Practices, developed because of the research, consisted of 33 items and a single dimension. The Cronbach alpha value (KR-20) was 0.81.

Conclusion: It has been determined that the Parental Knowledge Scale for Inhalation Practices (PKSIP) is a valid and reliable measurement tool that determines the knowledge level of parents of 0-6 years old children receiving inhalation therapy.

Keywords: Child, Inhalation, Parent, Scale Development.

ÖZET

Amaç: İnhalasyon uygulamaları için, ebeveyn bilgi ölçeği geliştirmek ve geçerlik-güvenirlik çalışması yapmak amaçlanmıştır.

Gereç ve Yöntem: Araştırma metodolojik tipte tasarlanmıştır. Araştırma, Erzurum ilindeki eğitim-araştırma hastanelerinin çocuk servislerinde Şubat 2020-Haziran 2022 tarihleri arasında gerçekleştirildi. Araştırma evrenini, hastanelerin çocuk servislerinde inhalasyon tedavisi alan 0-6 yaş arası çocukları olan ebeveynler oluşturmuştur. Ölçek madde sayısının dokuz katına ulaşılmış, araştırmanın örneklemini 390 ebeveyn oluşturmuştur. Verilerin analizinde frekans dağılımı, ortalama, standart sapma, minimum, maksimum, KR-20 güvenilirlik katsayısı ve Rasch analizi yöntemleri kullanılmıştır.

Bulgular: Ölçeğin madde ayrışma indeksi 8,38 ve madde güvenirliği 0,98'dir. Kişi ayrışma indeksi 1,99'dur. Rasch modelinde iç uyum değerleri 0,3-1,7 arasında değişmektedir. Katılımcıların ölçekten aldıkları ortalama puan 27,25±6,21'dir. Geliştirilen ölçek 33 maddeden ve tek boyuttan oluşmaktadır. Cronbach alfa değeri (KR-20) 0,81'dir.

Sonuç: İnhalasyon Uygulamalarına Yönelik Ebeveyn Bilgi Ölçeği inhalasyon tedavisi alan 0-6 yaş çocukların ebeveynlerinin bilgi düzeylerini belirleyen geçerli ve güvenilir bir ölçme aracı olduğu belirlenmiştir.

Anahtar Kelimeler: Çocuk, İnhalasyon, Ebeveyn, Ölçek Geliştirme.

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INTRODUCTION

The reason why respiratory system diseases are frequently seen in children is anatomical and physiological differences. When we look at the causes of death under the age of 5 in the world, pneumonia is one of the leading causes of death (WHO, 2019). According to the data of the Turkish Statistical Institute, respiratory system diseases rank third among the causes of death with a rate of 12.5% (TÜİK, 2018). For treating respiratory system diseases, the use of drugs by inhalation is widely preferred because of its rapid effect and low side effects (Gardenhire et al., 2017). Inhalation therapy is used in many newborn and pediatric respiratory system diseases (Laube et al., 2011). Inhaled drugs are the mainstay of treatment in many pediatric lung diseases. These treatments are given to patients receiving different types of respiratory support (Berlinski, 2017). The advantages of this treatment are that it does not cause injection-induced pain, has the same effect in the use of oral and parenteral corticosteroids, and provides a lower-dose product compared to inhaler antibiotics. Inhalation therapy breaks up the drug particles to a size that will reach the lower respiratory tract and inhale this aerosol (Gardenhire et al., 2017; Yüksel, 2014). The amount of the drug going to the lungs and distribution of the drug in the lungs change the effectiveness of the treatment. The properties of the drug (particle diameter, dynamics), inhalation type, and personal characteristics are among the factors that determine the effectiveness of the treatment (Yüksel, 2014). While the nose filters the inhaled drug particles, the oropharynx filters less. For this reason, the drug taken by mouth inhalation is stored more in the lungs (Amirav et al., 2015; Berlinski and Xi J, 2014; Cheng, 2014). Breathing movements also affect the amount of drugs stored in the lungs. The amount of storage of the drug also changes the severity of the disease. The severe obstruction in the respiratory tract prevents the drug from settling in the small airways, and the drug cannot be deposited evenly in the lungs (Laube, 2014). Children in the 0-6 age group who are treated in the hospital or at home do not have the skills to use the chamber face mask, inhaler and nebulizer effectively. Parents are the primary caregivers who will take the action in this process. When parents feel valued in the team, when they are part of the healthcare team, their feelings of trust and competence increase in managing their children's illness processes. Therefore, the nurse should maintain a relationship with the parents when the child is hospitalized. The continuation of the relationship between the nurse and the parent provides the necessary emotional support for the child (Antunes and Diogo, 2017; Park et al., 2018).

Subjects such as the position of the child, the intermediate apparatus used, the amount of the drug put into the device, the duration of administration, the cleanliness of the device, and the knowledge level of the parents about inhalation practices can change the effectiveness of the inhalation process (Laube et al., 2011). The practice of inhalation, which is frequently used, especially in children's services and at home, should be well-known by parents and health professionals. Therefore, it is important to determine the level of parental knowledge about inhalation practices. There should be a standard measurement tool to evaluate the knowledge level of parents regarding inhalation practices. It is seen that such a measurement tool has not been encountered at the national or international level and most of the studies evaluating inhalation practices were obtained using questionnaires. For this reason, there is a need to develop a scale to evaluate the level of parental knowledge about inhalation practices.

MATERIALS AND METHODS

This research was carried out methodological in order to develop the parental knowledge scale for inhalation practices. The research was carried out between February 2020 and June 2022 in the pediatric services of training-research hospitals in Erzurum.

Population and Sample of the Research

The population of the study consisted of parents with children aged 0-6 who received inhalation therapy in the pediatric services of the hospitals specified between February 2020 and October 2021, and who met the research criteria. In scale development and adaptation studies, it is necessary to reach 300-500 people in the literature or to reach 5-10 times the number of items in the scale (Alpar R, 2020; Seçer İ, 2015). In light of this information in the literature, 9 times the number of items in the scale has been reached and the study sample consisted of 390 parents.

Data Collection Tools

Descriptive Information Form

In the form prepared by the researcher based on the literature (Düdükcü and Taş Arslan, 2016; Pekcan, 2015; Şahin and Arikan, 2022), the age, gender, place of residence of the parent, family type,

socioeconomic level, educational status, occupation, number of children aged 0-6, diagnosis of the child, and reason for coming to the hospital, inhaled medicine (nebule) in the hospital or at home. There are a total of 12 questions about the use status of the child and how long the child has used the inhaled drug.

Parental Knowledge Scale for Inhalation Practices

The scale was developed to determine the knowledge level of parents about inhalation practices. The scale consists of one dimension and 33 items. There are reverse items in the scale. As the score obtained from the scale increases, the knowledge level of parents about inhalation practices increases positively.

Scale Development Stages

Creating an Item Pool

According to the research obtained by the researcher by scanning the databases of Scopus, Web of Science, Pub Med, Science Direct, YÖK Thesis, Google Scholar, Ulakbim using the keywords of inhalation practices, parent, child, nursing, and containing positive and negative information about inhalation practices a pool has been created (Gardenhire et al., 2017; Pekcan, 2015; Yüksel, 2014). Afterward, the item pool was presented to the opinion of 8 field experts and a new item pool was created by reducing it to 47 items in line with the feedback of the experts. After the preparation of the 47 item draft scale for inhalation practices, the peer assessment phase was initiated.

Peer Review

Within the scope of the face validity of the Parent Knowledge Scale for Draft Inhalation Practices, for the peer assessment phase, the researcher; sought the opinion of 5 parents who had children in the 0-6 age group receiving inhalation therapy. After this evaluation, without changing the meaning of the items in the scale, only Turkish expressions and visuals were added to make the Latin words more understandable, and spelling and punctuation corrections were made.

Expert Opinion

The draft scale was presented to the field experts (8 experts) to evaluate the suitability of the draft scale with the candidate statements prepared by the researchers for measurement. Every statement the experts; were asked to answer as “a= Appropriate, b= The item should be slightly revised, c= The item should be reviewed seriously, and d= The item is not suitable” and a line named “Suggestion” was added under each item so that they could write a suggestion when they wanted to express their opinion on the items. In line with the suggestions from the field experts (changing some expressions, removing similar expressions, reducing the number of items), the candidate expressions in the item pool were changed and an item pool of 47 items was formed and presented to the field experts again (8 experts).

Coverage Validation

The Parent Information Scale for Inhalation Practices, which is planned to be developed, was submitted to the opinion of 8 experts for an evaluation including cultural equivalence in order to ensure coverage validity. The coverage validity index in the study was obtained using the Davis (1992) technique. (Davis, 1992; Yurdugül, 2005) In the Davis (1992) technique, a four-point rating is made: “a=Appropriate, b=The item should be slightly reviewed, c=The item should be reviewed seriously, and d=The item is unsuitable”. With this technique used, the number of experts who preferred options a and b was divided by the total number of experts, and the 'coverage validity index' for the item was obtained. Without comparing this obtained value with a statistical criterion, the value of 0.80 was accepted as a criterion. Items with low coverage validity index were excluded from the scale. It is recommended that the Davis technique be performed with 3 to 20 experts. A statistical value of 0.80 was taken as a criterion in the study (Davis, 1992). Accordingly, these items (M2, M15, M31, and M42) were removed from the scale, since the CVI value of four items in the draft scale was found to be less than 0.80. The CVI value for all items of the study was found to be 0.89±0.127.

Pre-Execution (Pilot Application)

The “Parental Knowledge Scale for Inhalation Practices” was applied to 30 parents with different education levels, who were determined according to the convenience sampling method. These parents were not included in the main study. The face-to-face interview method was used in order to question their detailed opinions about the items on the scale.To the parents who applied the draft form; They were asked to express their opinions and views on the intelligibility of the items in the scale, the usefulness of the scale, the way it was answered, its directive, quality, scope, clarity of the items and whether they were suitable for their purpose. In line with these opinions obtained from the parents, necessary adjustments were made in the preliminary draft form of the scale and the scale was given its final form.

Data Collection

The research data were obtained through face-to-face interviews with the parents in the hospital room of the children, during the time period when the children of the parents who met the criteria for inclusion in the research by the researcher, were calm between February 2020 and October 2021. Before the interview, the parents were informed about the research (purpose, target, benefit, and time), and their verbal and written consent was obtained. It took an average of 15-20 minutes to fill out the Introductory Information Form and the Parent Information Scale for Inhalation Applications. Since the research data were collected during the COVID-19 pandemic period, interviews were held with the parents in line with the mask, social distance, and hygiene rules, taking into account the pandemic conditions.

Scoring of the Scale

The answers to 33-item "Parental Information Scale for Inhalation Practices" consists of two sets of correct and incorrect answers. For the “yes/no” answer type questions, the correct answer = 1 point, and the wrong answer = 0 points. Therefore, the highest score a participant can get from the scale is 33 and the lowest score is 0. The measurement tool consists of a one-dimensional structure. There are reverse expressions in the scale. Reverses 1., 2., 3., 4., 5., 6., 9., 10., 12., 13., 14., 15., 16., 21., 24., 26., Articles 27, 32 and 33. The higher the score obtained from the scale, the higher the level of knowledge of parents about inhalation practices.

Data Analysis

SPSS (Statistical Package for Social Sciences) for Windows 23.0 and WINSTEPS 3.9 programs were used to analyze the research data. While evaluating the research data, frequency distribution for categorical variables and descriptive statistics (mean, standard deviation, maximum, minimum) for numerical variables are given. Rasch analysis was used in the evaluation of the internal construct validity of the PKSIP. "A Dual (Dichotomous) Model” from Rasch Measurement Models was used. The reason for applying this model is that it is suitable for the answer format of the PKSIP. Question items; The binary model can be used when it consists of two categories: Agree/Disagree, Yes/No, and True/False (Elhan and Atakurt, 2005; Wright, B. D. and Mok, 2004).

Ethics Committee Approval

Ethics committee approval was received for this study from the Atatürk University Faculty of Medicine Clinical Research Ethics Committee (Approval Number:B.30.2.ATA.0.01.00/585, Approval Date: 26/12/2019).

RESULTS

Findings Related to the Characteristics of the Participants

More mothers participated in the research (76.2%), the average age of the parents was 32.18 ± 5.827, the parents mostly lived in the city center (68.5%), they belonged to the nuclear family (88.5%), the income of the participants was mostly equal to their expenses (55.9%), the majority of them were high school graduates (36.2%) and housewives (58.2%), the diagnosis of the children was bronchitis (39.7%), the reason for going to the hospital was mostly cough (56.9%), and the inhaler was mostly used for a month (50.0%).

In this study, in order to develop the Parental Knowledge Scale for Inhalation Practices in Turkish and to determine whether it is valid and reliable; Coverage validity, construct validity and internal validity were examined in three different ways. Before all these processes, scale development started with the creation of an item pool.

Findings Regarding Coverage Validity

After the item pool was created for the Parent Information Scale for Inhalation Practices, which is planned to be developed, it was presented to the opinion of 8 experts for an evaluation including cultural equivalence in order to ensure coverage validity.

Davis's (1992) (Davis, 1992; Yurdugül, 2005) technique was used to evaluate expert opinions. Experts reported their opinions for the items of the Draft scale as a=“Appropriate”, b=“The item should be slightly revised”, c=“The item should be reviewed seriously” and d=“The item is not appropriate”. The “coverage validity index (CVI)” for each item was obtained by dividing the number of experts who marked options (a) and (b) by the total number of experts. Statistically, a value of 0.80 was taken as a criterion and 4 items were removed from the scale because the CVI value of four items was less than 0.80. The CVI value for all items of the draft scale was determined as 0.89±0.127.

Findings Obtained According to the Result of Rasch Analysis

According to the Rasch analysis, the INFIT (in compliance) and OUTFIT (non-conformity) values of the items were checked. In this study, the value range of feet (INFIT, OUTFIT) between 0.7 and 1.3 was accepted as appropriate. The infit and outfit values of M35, M11, M26, M2, M31, M24, M12, and M38 according to the Rasch model are not in the range of 0.7-1.3, so they were excluded from the scale. In addition, when the PTMA values were examined, items with less than 0.20 were also removed from the scale. Therefore, it was decided to exclude M8, M11, M26, M34, and M35 from the scale.

In addition, item-person maps of the 43-item scale were examined. The distribution map of items and persons typically contains logit values ranging from -4 to +4, which determine the relationship of the construct to the response probability. On the right side of the distribution map, are the positions of the participants, and on the left, are the item positions on the logit scale according to the item difficulties. All items were distributed in the range of (-3 +4). The person distribution is between (-4, and +3), showing that the person measurements vary in this range.The range of item difficulties and person abilities indicated that item locations were higher than person locations.In other words, item difficulties are above parental abilities. The M35 shows the most difficult item at the top, and M12 shows the easiest item at the bottom. Since there was no individual matched with M35, it was decided that this item was difficult and should be deleted. After removing the relevant items, 33 items remained in the measurement tool, and the Rash analysis was repeated.

Final Dissociation and Reliability Results of the Parental Knowledge Scale for Inhalation Practices

The reliability of the scores obtained from the scale was calculated according to the Rasch measurement model. Table 1 generalization; item separation was 8.02 and item reliability was 0.98. The mean and standard deviation of internal agreement (INFIT) and external agreement (OUTFIT) for the items that these values were very close to the expected values. Internal fit and external fit are 0.99. The person dissociation value was 1.99. For individuals, the INFIT (internal fit) value was 1 OUTFIT (external fit) was 0.99. In the Rasch analysis, item reliability is interpreted as the KR-20 reliability value. Therefore, the item reliability of the 33-item Structure Information Scale for Inhalation Applications was found to be 0.98. In addition, the Cronbach alpha (KR-20) value is 0.81.

Table 1. Item Separation, Person Separation and Cronbach Alpha (KR-20) Values

	Total score	**Number of individual answers**	**INFIT**	**INFIT Z**	**OUTFIT**	**OUTFIT Z**
Person						
Mean	21.7	33	1.00	0	0.99	0
S.D.	5.4	0	0.22	1.1	0.42	1.1
Real RMSE	0.47		Person separation: 1.89		Person reliability: 0.78	
Item						
Mean	256.5	390	0.99	0	0.99	0.2
S.D.	72.6	0	0.0	1.8	0.18	1.9
Real RMSE	0.14		Item separation:8.02		Item reliability: 0.98	
Parental Knowledge Scale for Inhalation Practices Cronbach α:					0.81	

Fit Indices

Reconciliation indices were calculated for the 33-item Parental Knowledge Scale for Inhalation Practices. As can be seen in Table 2, the consistency statistics of the items in the scale are in the range of 0.7-1.3.

Table 2. Parental Knowledge Scale Compliance Values for Final İnhalation Practices

b	S.H.	INFIT	IN Z	OUTFIT	OUT Z	Observed PTMA	Expected PTMA	Observed FIT	Expected FIT	Item no
0.84	0.11	1.14	3.6	1.29	4.2	0.25	0.4	60.5	66.9	I 7
0.35	0.11	1.19	3.8	1.28	3.7	0.22	0.4	63.6	69.9	I 5
-0.62	0.13	1.15	1.9	1.27	2.1	0.23	0.38	78.7	80.4	I 37
-0.21	0.12	1.15	2.4	1.25	2.5	0.24	0.39	73.1	75.8	I 10
1.4	0.11	1.1	2.4	1.23	2.9	0.26	0.38	64.9	67.3	I 28
1.56	0.11	1.14	3.1	1.23	2.7	0.24	0.37	61.5	68.6	I 43
1.89	0.12	1.11	2.1	1.2	1.9	0.24	0.35	70.8	72.2	I 42
1.79	0.12	1.07	1.4	1.19	2	0.28	0.36	68.2	71	I 27
1.93	0.12	0.99	-0.2	1.12	1.1	0.34	0.35	74.1	72.7	I 23
1.16	0.11	1.05	1.4	1.11	1.6	0.33	0.39	65.1	66.8	I 22
1.34	0.11	1.02	0.6	1.1	1.3	0.35	0.38	68.2	67.2	I 21
0.08	0.12	1.06	1.1	1.09	1.2	0.34	0.4	70.3	72.6	I 18
0.02	0.12	1.07	1.4	1.02	0.3	0.34	0.4	70	73.2	I 4
-0.1	0.12	0.93	-1.2	1.04	0.5	0.45	0.39	75.9	74.6	I 39
-1.88	0.19	1.02	0.2	1.01	0.1	0.29	0.3	91	91.9	I 15
-0.15	0.12	0.94	-1	1.01	0.2	0.45	0.39	75.1	75.1	I 1
-0.12	0.12	0.98	-0.4	0.95	-0.6	0.42	0.39	74.6	74.8	I 9
-0.57	0.13	0.98	-0.2	0.92	-0.7	0.4	0.38	80	79.8	I 14
0.78	0.11	0.98	-0.4	0.96	-0.6	0.42	0.4	67.4	67.2	I 41
-1.06	0.15	0.96	-0.4	0.89	-0.6	0.39	0.36	85.6	85.1	I 40
0.27	0.12	0.95	-1	0.93	-1	0.44	0.4	72.3	70.6	I 3
-1.49	0.17	0.93	-0.6	0.76	-1.2	0.4	0.33	89.2	89	I 25
-0.24	0.12	0.92	-1.2	0.88	-1.2	0.46	0.39	76.4	76.1	I 13
-1.3	0.16	0.92	-0.8	0.82	-1	0.41	0.34	88.7	87.4	I 19
0.96	0.11	0.91	-2.4	0.87	-2	0.48	0.39	72.6	66.7	I 29
-1.06	0.15	0.91	-0.9	0.91	-0.6	0.42	0.36	86.2	85.1	I 30
-1.85	0.19	0.89	-0.7	0.86	-0.5	0.39	0.31	92.3	91.7	I 17
0.22	0.12	0.89	-2.4	0.88	-1.6	0.5	0.4	74.4	71.1	I 36
-2.04	0.21	0.86	-0.9	0.72	-1.1	0.42	0.29	93.1	92.9	I 32
-0.3	0.13	0.86	-2.3	0.81	-1.9	0.52	0.39	81	76.8	I 33
-0.85	0.14	0.85	-1.9	0.7	-2.4	0.52	0.37	84.1	82.9	I 20
-0.37	0.13	0.84	-2.6	0.7	-3.2	0.55	0.39	80.5	77.5	I 6
-0.4	0.13	0.84	-2.6	0.73	-2.8	0.54	0.39	80.5	77.8	I 16

b: Difficulty parameter , IN Z: Standardized INFIT, OUT Z: Standardized OUTFIT, PTMA: Point measure correlation

Item-Person Map

For the Parental Knowledge Scale for Inhalation Practices, an item-person map was prepared. When Figure 1 is examined; items (-2, +3) and persons (-4, +4). It was observed that the items in the scale correspond to individuals. The person-item map is listed as the most difficult item (M23) at the top and the easiest item (M32) at the bottom. Accordingly, the easiest item of the measurement tool was determined as M32 and the most difficult item was M23. The b value in Table 2 also gives information about item difficulty. Accordingly, the difficulty value of M32 was -2.04 and the difficulty value of M23 was 1.93.

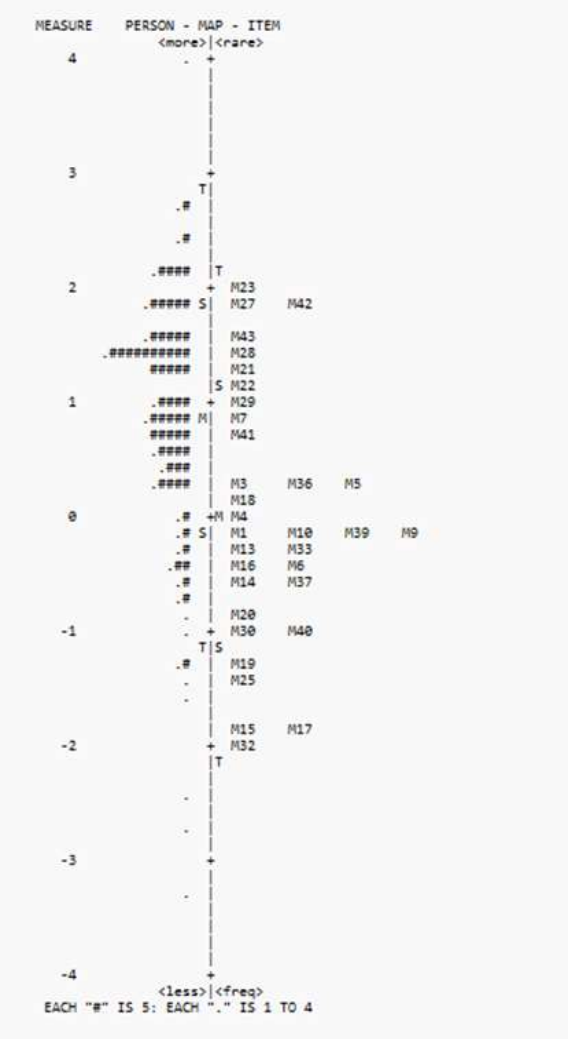

Figure 1. Item-person map (33 Item)

Unidimensionality

When Table 3 is examined; 28.5% of the total variance can be explained by Rasch model measurements. The unexplained variance of 71.5% is determined by looking at the 1st contrast, whether they create a structure other than the one desired to be measured. According to Table 3, 12.2% of the 28.5% variance explained by the Rasch model is due to individual parameters and 16.3% to item parameters. The variance, which cannot be explained by the Rasch model and is assumed to be due to randomness, is 71.5%, while the variance of the first contrast over the entire data set is 2.58%.

Table 3. One-Dimensional Structure Values

	Eigenvalue	Observed		Expected
Total variance in observations	46.1430	%100		%100
Variance explained by measurements	13.1430	%28.5		%28.5
Variance explained by persons	5.6093	%12.2		%12.2
Variance explained by items	7.5337	%16.3		%16.3
Total unexplained variance	33.0000	%71.5	%100	%71.5
1. Unexplained variance in dimension	2.5805	%5.6	%7.8	
2. Unexplained variance in dimension	2.0291	%4.4	%6.1	
3. Unexplained variance in dimension	1.6727	%3.6	%5.1	
4. Unexplained variance in dimension	1.6666	%3.6	%5.1	
5. Unexplained variance in dimension	1.5375	%3.3	%4.7	

DISCUSSION

Discussion of the Findings Regarding the Reliability of the Parental Knowledge Scale for Inhalation Practices

The Cronbach Alpha coefficient can be used to evaluate the overall reliability of a scale consisting of items with dichotomous answers. In this case, the calculated Cronbach Alpha coefficient is called the KR-20 coefficient (Özdamar, 2017). Cronbach Alpha (KR-20) shows whether the items in the scale adequately measure the same structure. Reliability is a measurable value and is measured by the reliability coefficient (Baştürk, 2010). The Cronbach Alpha coefficient of a scale takes a value between 0 and 1, this value is desired to be close to 1. Cronbach Alpha; "If $\alpha < 0.40$; scale is unreliable. The scale needs to be rearranged", "If $0.40 \leq \alpha < 0.50$; the scale has a very low level of reliability", "If $0.50 \leq \alpha < 0.60$; the scale has a low level of reliability", "if $0.60 \leq \alpha < 0.70$; the scale has a sufficient level of reliability", "If $0.70 \leq \alpha < 0.90$; the scale has a high level of reliability" and "if $\alpha \geq 0.90$, the scale has a very high level of reliability (Özdamar, 2017). This value was calculated for the Parental Information Scale for Inhalation Applications and the internal consistency coefficient Cronbach Alpha (KR-20) was found to be 0.81 (Table 1). Accordingly, it can be said that the scale is highly reliable and can be used safely in community screening and in forming scientific opinion about inhalation practices.

The reliability coefficient for Rasch analysis is calculated and interpreted in the same way as Cronbach Alpha or KR-20 (Güler et al., 2017). With the Rasch analysis, two reliability estimations are obtained, namely item reliability and person reliability.When the separation index value is 1.00; It indicates low errors, good separation of item difficulties and person measures throughout the scale, and high discrimination ability. As in classical reliability results, it is said that reliability increases as the reliability coefficient approaches + 1.00 in Rasch analysis (Muijs, 2010).

For this study, the item dissociation index was found to be 8.02 and the item reliability was 0.98. According to the substance dissociation index, there are approximately 8 separation levels. This result shows that the items match many skill levels. Internal compliance and external compliance for substances are 0.99 (Table 1). These measurements showed that the items fit the model well. The person dissociation index is an indicator of dissociation measures in the person. It shows how reliable the individuals in the group to which the scale is applied are distinguished from each other (Muijs, 2010). The person dissociation value indicates how many different skill levels the scale describes. This value was found to be 1.99; the scale does not change for two parents at the same ability level. For individuals, the internal fit value was 1.00 and the external fit value was 0.99 (Table 1). These values are expected to be around 1 (Baker, 2016).

Two types of reliability indices are estimated with the Winsteps application; One of these reliability is person reliability and the other is item reliability. Dissociation, like reliability, is an indicator of the repeatability of person and item parameters.Person segregation is used to classify the people in the sample. If the individual reliability is less than 0.8 and the dissociation coefficient is less than 2, this is interpreted as the items in the scale are not sensitive enough to distinguish between high and low performers and the number of items in the scale should be increased. Item decomposition is used to verify the hierarchy of the items in the scale (Linacre, 2012).

When item reliability is less than 0.9 and item divergence is less than 3, it means that there is not a large enough sample to confirm the item hierarchy (Linacre, 2012). In addition, there is an inverse relationship between standard error and dissociation, so the dispersion coefficient increases as the standard error decreases. When the divergence is less than 1, and the reliability is less than 0.50, the differentiation is interpreted as an error (William P. Fisher, 1992). In achievement tests, a scale above 0.50 is sufficient for reliability (Büyüköztürk Ş., 2020). Therefore, when the dissociation values and reliability values obtained from the 33-item Parental Information Scale for Inhalation Applications were interpreted, it was concluded that the measurement tool was reliable.

Discussion of the Findings Regarding the Validity of the Parental Knowledge Scale for Inhalation Practices

Coverage validity shows whether the items that make up the scale are sufficient in terms of quantity and quality to measure the behavior to be measured (Baştürk, 2010). Scale items are presented to experts and evaluated, and their coverage validity is calculated for the items and the scale (Şencan, 2005). The majority of experts are asked to agree (Çapık et al., 2018).

The coverage validity index in the study was obtained using the Davis (1992) technique. In the Davis (1992) technique, a four-point rating is made as, "a = Appropriate, b = Item should be slightly reviewed, c = Item should be reviewed seriously, and d = Item not suitable". With this technique, the number of experts who preferred options an (appropriate) and b (item should be slightly revised) was divided by the total number of experts to obtain the 'coverage validity index' for the item .Without comparing this obtained value with a statistical criterion, 0.80 was accepted as a criterion. Items with low coverage validity index were excluded from the scale. It is recommended that the Davis technique be performed with 3 to 20 experts (Davis, 1992; Yurdugül, 2005). In the research, an item pool consisting of 76 candidate statements about inhalation practices was created and presented to 8 experts' opinions. In line with the suggestions from the field experts (changing some expressions, removing similar expressions, reducing the number of items), the candidate expressions in the item pool were altered and a new item pool consisting of 47 items was created and presented to the field experts again (8 experts). A value of 0.80 was taken as a criterion for CVI and 4 items (M2, M15, M31, and M42) were removed from the scale because the CVI value of four items in the ranking was found to be lower than the criterion value of 0.80. The CVI value for all items of the study's Parent Information Scale for Inhalation Practices was found to be 0.89±0.127.

Discussion of the Findings Regarding the Construct Validity of the Parental Knowledge Scale for Inhalation Practices

The Rasch model in the research was first introduced by Danish mathematician George Rasch in the 1960s (Baker, 2016). This model is a one-parameter logistic model under the umbrella of item response theory. The model includes the item difficulty parameter (Hasford and Bradley, 2011). The model was initially developed for dichotomous items scored as "true/false", "yes/no" or "agree/disagree" (Haiyang, 2010). With Rasch analysis, individuals are ranked according to their abilities, while scale items are ranked according to their difficulties. As a result, it is tried to estimate the probability of individuals performing the tasks appropriate to their abilities. One of the strengths of the Rasch model is that the logit scale obtained as a result of the analysis is used to determine whether there is an item that should be added to the scale. Moreover, the distribution of the items and persons on this scale provides information on how well the items and the sample match, and how the easier or stronger items in the scale affect the discrimination of the scale (Brinthaupt and Kang, 2014). In this model, both the reliability coefficient for the item surface and the reliability coefficient for the person surface is obtained.This enables us to determine with which reliability the individuals in the group to which the scale is applied are distinguished from each other (Muijs, 2010).

In the Rasch model, it is considered optimal that the values for each item in each subscale (INFIT and OUTFIT) are between 0.5 and 1.5, and it is stated that the values above 2 do not fit the model (de Ayala, 2022; Wright, B. D., and Linacre, 1994). The concordance statistics of the items in the research scale are between 0.7 and 1.3 (Table 2). This result shows that the model-item fit is sufficient. When the item-person graph of the scale is examined, it is between -2 and +3; individuals are in the range of -4, and +3 (Figure 1). It was observed that the items in the scale corresponded to individuals and it was determined that the items in the scale were ordered from easy to difficult and that they adequately measured the -2 and +3 logistic measurement range. The b value in Table 2 also gives information about item difficulty. As a result, it was seen that the model-item fit of the 33-item final scale was sufficient and the Parental Knowledge Scale for Inhalation Applications was appropriate.

When the one-dimensional structure of the scale was examined, it was determined that 28.5% of the total variance could be explained by Rasch model measurements and that 71.5% of the unexplained variance formed a structure other than the structure that was wanted to be measured, was determined by looking at the first contrast (unexplained variance in the 1st dimension) (Table 3). In this case, it can be said that the variance arising from the first contrast is not large enough to damage the measurements and is not sufficient to create a structure other than the one to be measured. Linacre (2012) also stated that if the eigenvalue in the 1st contrast is less than 2, the scale is unidimensional (Linacre, 2012). When Table 3 is examined, the eigenvalue of the 1st contrast is found to be greater than 2. In this case, Stevens' (2002) criteria provide a framework for interpreting the meaning of eigenvalues greater than 2.00. Specifically, (a) at least three items with absolute loads greater than 0.80 are loaded on it, (b) at least four items with absolute loads greater than 0.60 are loaded on it, (c) at least 10 items with absolute loads greater than 0.40 if installed; A contrast with an eigenvalue greater than 2.00 can be a

separate dimension (Stevens, 2002). According to the results of the analysis, 4 of the factor loads are above 0.40. The fact that the INFIT and OUTFIT values of the items in the scale are within the specified range indicates that all of the scale items measure the same thing, which indicates the unidimensionality of the scale (Linacre, 2012). The concordance statistics of the items in the research scale are between 0.7 and 1.3 (Table 2). Therefore, it is supported that the scale has a one-dimensional structure.

CONCLUSION

The following results were obtained in the methodological research carried out to develop a valid and reliable measurement tool to evaluate parental knowledge levels about inhalation practices:

- "Parental Knowledge Scale for Inhalation Practices" is a valid and reliable measurement tool.

In line with the research results;

- Using the scale to determine the knowledge level of parents about inhalation practices,
- Using the scale in experimental studies to better evaluate the effectiveness of the scale,
- It is recommended that pediatric nurses use the scale to evaluate the knowledge level of parents of children aged 0-6 receiving inhalation therapy.

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Author Contributions

Plan, design: AŞ; **Material, methods and data collection:** AŞ, FK; **Data analysis and comments:** AŞ; **Writing and corrections:** AŞ, FK; **Supervision:** FK.

Conflict of interest

The authors declare no conflict of interest.

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