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RESEARCH ARTICLE

Examining the Validity and Reliability of Perception of Health News Perception Scale (PHNS) Through Confirmatory Factor Analysis

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ABSTRACT

Health news has been featured in the media since the early days of news production. The purpose of health news is to inform the public. However, starting from the 1990s, health news took on a commercial tone due to developing policies, and since then, health news has begun to promote institutions, organizations, doctors, or pharmaceutical companies. Nowadays, health news is designed as a form of perception management. In 2018, a scale was developed by Çınar and colleagues to examine this issue. However, researchers noted the scale fell short in certain aspects. They recommended the 'Perception of Health News Scale' (PHNS) be tested using Confirmatory Factor Analysis (CFA). Currently, the PHNS is being used without undergoing CFA testing. The literature states that CFA is essential for the development of a scale. There is strong evidence that using a scale without performing this test may result in inaccurate outcomes. This study aimed to model the CFA structure of the PHNS and validate the scale's accuracy and reliability. The study used Descriptive analysis techniques and CFA, and at the end of the study, it was found that the PHNS did not conform to the CFA fit indices. As such, due to invalidation, the scale was rejected. Researchers also examined the convergent validity, discriminant validity, and reliability of the PHNS for future use. These analyses could facilitate item writing so researchers can redevelop the PHNS if required.

1. INTRODUCTION

After World War II, the idea of citizens having political, civil, and economic rights was widely accepted. As a right, health was included within this social framework (Topkaya, 2016). According to the Glossary of Health Promotion and Development (WHO, 1998), health is not merely the absence of disability or disease but an individual's mental, physical, and social well-being. Health is among the fundamental human rights. Many developed and developing countries implement specific laws and policies to protect health as a fundamental human right. Post-1830s, mainstream media in these countries began to inform the public about health issues, giving rise to a new type of journalism, Health journalism.

Health journalism includes reporting on cancer, obesity, childhood diseases, medications, treatments, methods, and discoveries related to various diseases (Summ & Volpers, 2016). It is a subcategory of science journalism. While this type of journalism was not considered valid until about

50 years ago, it is now recognized as necessary (Ayaz, 2019). The COVID-19 pandemic strengthened the role of health journalism in informing the public.

In the early years of health news, countries generally provided educational information on sexually transmitted diseases (AIDS, syphilis, gonorrhoea), nutrition, and body hygiene. The state played a significant role in the planning and content of this information dissemination. World War II marked a turning point in health journalism. Health news began reaching the country's far corners with the increasing number of radios. By the 1990s, health journalism made its appearance on private television channels, leading to the emergence of developments and challenges. Specializations became essential, and the proliferation of private hospitals led to the commercialization of health journalism.

Health journalism serves functions such as informing the public about health-related issues, promoting health, and raising awareness and consciousness (Yavaşçalı & Şirvanlı, 2022) the earliest examples of this type of news adhered to these goals. However, recent studies (Kazaz & Acar, 2021) suggest that health news has strayed from its primary function of raising public awareness. With internet technology advancement, the role of health news has become sensationalized. Consequently, it facilitated public perception management (Ayaz, 2019). Today, health news is often designed to advertise private hospitals, doctors, medications, treatment methods, companies, or suppliers (Utma, 2019; Kayıhan & Hülür, 2018; Ayaz, 2019). Research on perception management in health news has increased in intensity. In his study, Ayaz (2019) found that 33% of health news included promoting private hospitals or doctors, attempting to create a perception of health consumption. Another study (Utma, 2019) revealed that health news generally uses sensational and exaggerated language, creating perceptions of despair regarding illnesses or treatments. Yüksel and Karakuş (2012, p. 52) noted that the perceptions of women (82%) are mainly targeted in health news, with a constructed manipulation to encourage the purchase of health products. Kayıhan and Hülür (2019) also discovered that risk-related terms used in health news are employed to promote product consumption.

In studies on health news found in the literature, the focus has predominantly been examining individuals' perceptions. To this end, Çınar and colleagues conducted a scale development study in 2018. However, the study was found to be lacking in certain aspects. After their research, Çınar and colleagues (2018) recommended performing confirmatory factor analysis (CFA) to enhance the validity and reliability levels of the scale they developed. Other studies in the literature (Topsakal & Anamur, 2022; Öcel, Eş & Alramazanoğlu, 2023) indicated that the scale had been used without conducting a confirmatory factor analysis. In this research, following the recommendation of Çınar and colleagues (2018), a confirmatory factor analysis was performed on the Perception of Health News Scale they developed.

2. METHOD

In social sciences, scales are often necessary to explain a subject because these sciences comprise theories and norms that aim to provide accurate information (Desjeux, 2005). Scales are required to achieve this goal. Using a scale in research or creating a new scale from scratch allows for concretising a theory (Acot, 2017).

Scales used in research can be prepared differently through development or adaptation. The former involves developing a scale based on theoretical information in the literature, while the latter consists of adapting a scale developed in a different culture to the target community. Researchers must adhere to specific standards when developing a new scale or adapting an existing one (Çüm & Koç, 2015). Using a scale that does not meet fundamental standards such as validity and reliability can lead to erroneous results. When deciding to adapt a scale, it is first necessary to obtain permission from the original developer of the scale (Hambleton & Patsula, 1999). In this study, permission was initially

obtained via email from Çınar and colleagues (2018), who had recommended improving the reliability of the PHNS scale.

2.1 Procedure for enhancing reliability and validity

Scale development and adaptation studies are conducted systematically according to specific criteria. In such research, the following steps are typically followed: literature review, creation of an item pool, expert opinions on the items, linguistic equivalence, pilot study, internal consistency, factor analyses (exploratory and confirmatory), test-retest, and model validation. However, some of these studies in Turkey are conducted incorrectly (Çüm & Koç, 2015; Şahin & Boztunç Öztürk, 2018). Çüm and Koç (2015) identified that between 2005 and 2013, scale development and adaptation studies frequently used Cronbach's α and exploratory factor analysis (EFA). EFA should be conducted first to determine the measured construct, followed by confirmatory factor analysis (CFA) with a newly formed sample (Cabrera-Nyugen, 2010; Henson & Roberts, 2006; Worthington & Whittaker, 2006). Çınar and colleagues (2018) attempted to determine the construct validity of the PHNS scale using only EFA. In this study, CFA was used to enhance the validity and reliability of the PHNS scale.

2.2 Study group

The research was conducted cross-sectionally with 415 university students, 220 women and 195 men. The participants were required to meet the criteria of being native Turkish speakers and university students. A total of 415 university students who met these criteria were included in the study group. Data were collected through face-to-face surveys with students from the Communication Faculty of Selçuk University. The average age of the study group was 22.13 years.

2.3 Used scales

The PHNS was developed with 36 items. A pilot study was conducted with 50 university students to test the scale. Structural validity, item analysis, and internal consistency analyses were performed for reliability coefficient calculation. Two weeks later, the same 50 students underwent a test-retest method.

The PHNS consists of 36 items rated on a 5-point Likert scale, ranging from 1 = "strongly disagree" to 5 = "strongly agree." The highest possible score from the scale was set at 180, and the lowest score at 36. An increase in participants' scores on the scale indicates an increase in their perceptions of health news.

In the study, an analysis was first conducted to determine the correlation between the item-total score on the scale. Six items with a correlation (r) value below 0.30 were removed from the scale. All subsequent analyses in the study were performed on the remaining 30 items. The Kaiser-Meyer-Olkin (KMO) coefficient was 0.80, and the Bartlett test result was $X^2 = 2356.677$. It was found that the sample adequacy of the 30 items was significant ($p = 0.000$, $p < 0.001$). The Exploratory Factor Analysis (EFA) steps were then carried out. Principal Components Analysis and Varimax Rotation Method were used for factor analysis. It was determined that the 30 items were grouped into six factors. The Varimax orthogonal rotation technique was applied. Four items with a factor loading value below 0.30 were removed from the scale. The remaining 26 items were grouped into five factors. The item distribution across factors was as follows: F1 = 7; F2 = 3; F3 = 7; F4 = 6; and F5 = 3. The factors were named in sequence as commercial concern/advertisement (F1), promotion of consumption (F2), negative impact on health behavior (F3), desire for treatment and exploitation (F4), and trust in health journalism (F5). The factors explained 53.380% of the total variance of the scale. The variance values were: F1 = 21.795%, F2 = 12.526%, F3 = 7.338%, F4 = 6.623%, and F5 = 5.098%. The Cronbach's α value for the 26 items on the scale was .84. The Cronbach's α values for the factors were: commercial concern and advertisement .75; promotion of consumption .74; behavior change .65; exploitation of

health behavior .71; and trust in health journalism .79. The correlation between the total score of the scale and all factors was examined. A significant positive correlation was found at $p < 0.001$ and $p < 0.005$. The analyses indicated that the scale could be used in this form to determine individuals' perceptions of health news. At the end of the study, the structure was recommended to be strengthened with Confirmatory Factor Analysis (CFA).

2.4 Ethical approval

Approval was received from the Social Sciences Ethics Review Board of Sivas Cumhuriyet University (Decision No: 2023/11, Date: 10/07/2023).

2.5 Data analysis

To validate the SHA scale, the following criteria were used: Chi-square/df (<5 is acceptable), GFI (>0.85 is acceptable), CFI (>0.95 is acceptable), NFI (>0.90 is acceptable), TLI (>0.90 is acceptable), IFI (>0.90 is acceptable), RMSEA (<0.08 is acceptable) (Schumacker & Lomax, 2004; Kline, 2011; Tabachnick & Fidell, 2001; Meydan & Şeşen, 2015); corrected item-total correlation coefficients (>0.3 is acceptable; Kartal & Bardakçı, 2018), CR (>0.7 is acceptable; Hair et al., 2010; Kartal & Bardakçı, 2018); AVE (>0.5 is acceptable; Fornell & Larcker, 1981), and finally, internal consistency analysis (Cronbach's α >0.7 is acceptable; Lin et al., 2018) were used.

Factor analysis was first employed to validate SHA. Factor analysis examines the relationship between factors and the variables representing these factors (Acar Bolat, 2008). Factor analysis is divided into exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA uncovers the latent variables, or factors, underlying the observed variables. CFA tests the compatibility of the structure identified by EFA with data obtained from another sample (Kartal & Bardakçı, 2018). The primary condition for performing CFA is the existence of a pre-determined structure (Schumacker & Lomax, 2004; Brow, 2006). CFA examines both the testing of hypotheses and the accuracy of the structure of a newly developed scale. Particularly in scale development research, the structure emerging from EFA should be tested with CFA (Worthington & Whittaker, 2006; Yaşlıoğlu, 2017). The confirmatory factor analysis (CFA) method was used in this study. All statistical analyses in the study were conducted using IBM SPSS 24.0 (IBM Corp., Armonk, NY) and IBM AMOS 24.0 (IBM Corp., Armonk, NY).

2.5.1 Findings related to construct validity

At this stage of the study, the construct validity of the SHA was examined. The findings from the CFA are presented in the subsections. Analyses were conducted on the scale's standard factor loadings, convergent and discriminant validity, and reliability coefficients.

2.5.1.1 CFA findings

In accordance with the results obtained from the EFA conducted by Çınar et al. (2018), the CFA model was specified with 5 factors and 26 items. Fit indices were used to interpret the CFA results. Fit indices commonly used in the literature include χ^2/df, GFI, CFI, NFI, TLI, IFI, and RMSEA (Albayrak, Güngören, & Horzum, 2014; Torun, 2019; Kayhan, Bardakçı, & Caz, 2020; İlhan & Çetin, 2014).

Table 1: PHNS's CFA Fit index value ranges

	x^2/sd	GFI	CFI	NFI	TLI	IFI	RMSEA
SHA	2,597	0,870	0,849	0,777	0,830	0,850	0,062

According to Table 1, χ^2/df = 2.597; GFI = 0.870; CFI = 0.849; NFI = 0.777; TLI = 0.830; IFI = 0.850; and RMSEA = 0.062. Based on these fit indices, the model showed a good fit with χ^2/df = 2.597 < 5;

GFI = 0.870 > 0.85. However, the CFI = 0.849 < 0.95; NFI = 0.777 < 0.90; TLI = 0.830 < 0.90; and IFI = 0.850 < 0.90 are below the critical values. RMSEA = 0.062 is acceptable as it is below 0.08. Among the 7 different fit indices (χ^2/df, GFI, CFI, NFI, TLI, IFI, RMSEA), only 3 (χ^2/df = 2.597 < 5; GFI = 0.870 > 0.85; RMSEA = 0.062 < 0.08) met the critical values. The model was revised since the fit indices did not fall within the critical range. From the initial CFA, the model began to provide suggestions for modification. A revised structure based on modification indices may yield a stronger and more fitting result (Yardımcı, 2016). The modification suggestions provided by the model were examined. According to Appendix 1, there is a covariance of 40.404 between e1 and e2 (see Appendix -1). Under the same factor, these two items were linked, and the model was run a second time. The new fit indices were χ^2/df = 2.448; GFI = 0.877; CFI = 0.863; NFI = 0.791; TLI = 0.846; IFI = 0.865; and RMSEA = 0.059. The model still did not fit well. The model's modification procedures should be performed no more than 5 or 6 times (Yardımcı, 2016). The model was run up to the 5th modification.

In the 2nd modification, the model suggested linking e11 and e17, as shown in Appendix 2. After performing the 2nd modification, the analyses were repeated. The fit indices were χ^2/df = 2.360; GFI = 0.883; CFI = 0.872; NFI = 0.799; TLI = 0.855; IFI = 0.873; and RMSEA = 0.057 (see Appendix -2). The model did not yield a satisfactory fit.

In the 3rd modification, the model proposed linking e13 and e17. After performing this modification, the fit indices were re-evaluated. According to Appendix 3, the fit indices were χ^2/df = 2.308; GFI = 0.887; CFI = 0.877; NFI = 0.804; TLI = 0.860; IFI = 0.879; and RMSEA = 0.056 (see Appendix -3). The model still did not provide a good fit.

In the 4th modification, the model suggested linking e12 and e13. The fit indices after this modification were χ^2/df = 2.275; GFI = 0.889; CFI = 0.881; NFI = 0.808; TLI = 0.864; IFI = 0.882; and RMSEA = 0.055 (see Appendix 4). The model again did not fit well.

For the 5th modification, the model suggested linking e11 and e16 according to the model proposal in Appendix 5. The fit indices were χ^2/df = 2.228; GFI = 0.892; CFI = 0.885; NFI = 0.812; TLI = 0.869; IFI = 0.887; and RMSEA = 0.054 (see Appendix 5). The model still did not fit well. If a model is found to have acceptable fit indices after repeated testing, it is considered acceptable; however, if no further modifications are possible, the model is rejected (Meydan & Şeşen, 2015). In the CFA analysis, none of the 5 modifications yielded fit indices within the acceptable range. Therefore, the SHA scale could not be validated and was rejected.

The researchers continued the analysis because they were interested in how the item loadings were distributed. Different opinions about factor loading values are found in the literature. Hair et al. (1999) suggest that a factor loading value of at least 0.40 is necessary for an item to be considered valid. Karaman et al. (2017) emphasize that a factor loading should be at least 0.30. Büyüköztürk (2002) accepts a factor loading value of 0.30 regardless of its sign. Çakır (2014) indicates that this value should ideally be 0.40 or higher, but in scales with a small number of items, this threshold can be lowered to 0.30. In this study, interpretations were made based on both viewpoints. According to the opinions of Karaman et al. (2017), Büyüköztürk (2002), and Çakır (2014), the CFA results revealed that the standard factor loading values for the 26 items of SHA ranged from 0.304 to 0.750. All factor loadings for the items were found to be significant. The ability of the SHA items to predict factors was significant and greater than 0.30 for all sub-dimensions. Considering Hair et al.'s (1999) suggested factor loading value of 0.40, it was determined that items 18 and 24 should be removed from the scale. Çınar et al. (2018) also accepted the 0.30-factor loading threshold in their original research's EFA phase. In this study, the 0.30 threshold was adopted. The convergent, discriminant, and validity findings for all 26 items were examined.

Table 2: Standard factor loadings of PHNS's items as a result of CFA

Item Numbers *	Factor Names	Factor Loadings
PHNS1		,686
PHNS2		,712
PHNS3		,744
PHNS4	F1= Commercial concern and advertisement	,673
PHNS5	7 Items	,517
PHNS6		,625
PHNS7		,711
PHNS8		,562
PHNS9	F_2= Promotion of consumption	,741
PHNS10	3 Items	,750
PHNS11		,486
PHNS12		,629
PHNS13		,476
PHNS14	F_3= Behaviour change	,688
PHNS15	7 Items	,465
PHNS16		,612
PHNS17		,453
PHNS18		,304
PHNS19		,602
PHNS20		,655
PHNS21	F_4= Exploitation of health behavior	,692
PHNS22	6 Items	,670
PHNS23		,520
PHNS24		,367
PHNS25	F_5= Trust in health journalism	,480
PHNS26	3 Items	,595

2.5.1.2 Convergent validity, discriminant validity, and reliability findings

For convergent and discriminant validity, AVE and CR values were calculated, and Cronbach's Alpha (α) coefficient was examined. Convergent validity is achieved if each factor in the scale has an AVE value greater than 0.50 and a CR value greater than 0.70 (Fornell & Larcker, 1981; Hair et al., 2010). The calculated AVE values for the factors ranged from 0.47 to 0.23. Kartal and Bardakçı (2018) state that the AVE value should be greater than 0.50. CR values ranged from 0.53 to 0.83. CR values must

be greater than 0.70, and CR values should exceed AVE values, with AVE values also greater than 0.50 (Yaşlıoğlu, 2017). Although all CR values are higher than the AVE values, all AVE values are below 0.50. The CR values for the F5 and F2 factors are below 0.70. Therefore, the SHA does not possess convergent and discriminant validity.

Table 3: Findings regarding convergent validity, discriminant validity and reliability of PHNS

Factors	AVE	CR	Cronbach's Alpha
F1	0,43	0,83	0,847
F2	0,47	0,68	0,713
F3	0,38	0,76	0,743
F4	0,34	0,73	0,742
F5	0,23	0,53	0,468

AVE: Average Variance Extracted; CR: Composite Reliability

Note: Cronbach Alpha (α) coefficient for the entire 26-item PHNS 0.88.

The Cronbach's alpha coefficients for all factors of the SHA were examined. The interpretation of Cronbach's alpha values is as follows: $0.5 < \alpha$ is unreliable; $0.6 \geq \alpha \geq 0.5$ is poor; $0.7 \geq \alpha \geq 0.6$ is questionable; $0.8 \geq \alpha \geq 0.7$ is acceptable; $0.9 \geq \alpha \geq 0.8$ is good; and $\alpha \geq 0.9$ is excellent. The Cronbach's α coefficients for the factors of SHA are: commercial concerns and advertising ($\alpha = 0.847$) are good; consumption orientation ($\alpha = 0.713$), behavior change ($\alpha = 0.743$), and misuse of health behavior ($\alpha = 0.742$) are acceptable; while belief in health news ($\alpha = 0.468$) falls into the unreliable range. The 5th factor, belief in health news, was found to have low internal consistency. The Cronbach's Alpha (α) coefficient for all 26 items of SHA is 0.88.

CONCLUSION

In the study, the structure of SHA obtained through EFA was first tested using CFA. Among the fit indices of the CFA, only 3 met the critical values. Modifications were made to improve the CFA model based on the data obtained. However, all modifications resulted in fit indices that remained below the critical values. Even after the 5th modification, it was determined that the structure was not compatible with the model. Therefore, SHA was rejected due to its lack of validation.

Another result of the study was the examination of the standard factor loadings of the items. SHA18 (0.304) and SHA24 (0.367) fell below the 0.40 threshold. There are varying opinions in the literature regarding the factor loading coefficient (Hair et al., 2019; Karaman et al., 2017; Büyüköztürk, 2002; Çakır, 2014). Based on the 0.40 threshold, it was found that the number of items on the scale decreased to 24. It was concluded that these 2 items were not related to the factors.

The factors' reliability coefficients were also examined. It was found that Cronbach's α coefficient for the belief in health news items ($\alpha = 0.468$) was unreliable.

In conclusion, SHA was deemed an unsuitable scale for assessing individuals' health news perceptions.

RECOMMENDATIONS

Before starting the study, the researchers sensed some discrepancies between certain items and factors of the SHA. They realized that the concepts of health programs and health news, as originally defined in the scale, are distinct. Çınar et al. also suggested that these items more accurately reflect health news rather than health programs. The original developers of the scale also noted that appropriate changes could be made to the items. Additionally, the researchers highlighted that some

items in SHA did not fit well within their current factors. It is recommended that judgments, particularly in the area of news and health news, be evaluated by experts working in these fields.

The researchers also examined the item, convergent, discriminant, and validity analyses of SHA. This is because other researchers may wish to develop the scale further. Çınar et al. (2018) could revise the scale based on the results of this study from the beginning.

It is recommended that the current version of the scale, as found in the literature, not be used in research because it may yield erroneous results regarding validity and reliability.

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