ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

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Translation and Validation of the Hearing Protection Assessment Scale in Turkish: Reliability and Validity Study

İşitme Koruması Değerlendirme Ölçeği'nin Türkçeye Uyarlanması: Geçerlik ve Güvenirlik Çalışması

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ABSTRACT Objective: The study aims to adapt the Hearing Protection Assessment (HPA-2) scale in Turkish to ensure its reliability and validity. The HPA-2 scale assesses supports and barriers related to employees' hearing protection behaviors by associating them with personal and environmental factors. Despite legal regulations, the frequency of workers using hearing protection is relatively low in Türkiye. Exploring the factors under employees' hearing protection behaviors is important to promote a noise-safe environment. **Material and Methods:** The HPA-2 scale, developed by Reddy and his colleagues, consists of 18 5-point Likert-type items. The adaptation of the scale (HPA-2-Tr) was conducted with two experts in linguistics. A cross-sectional study was conducted to assess the reliability and validity of the scale among 423 employees in noisy workplaces. Purposive sampling was used in the study. Demographic data was collected using a form developed by researchers, and the HPA-2-Tr scale was administered to the participants. The construct validity was established by conducting exploratory (EFA) and confirmatory factor analyses via IBM SPSS 25.0 and AMOS 25.0, respectively. **Results:** The EFA yielded a three-factor structure that differed from the original scale. The model fit indices (CFI= 0.937, GFI= 0.900, RMSEA= 0.068, NFI= 0.908, and TLI=0.926) were within the acceptable range. The scale's KR-20 value was 0.881, and the Spearman-Brown reliability coefficient was 0.915. **Conclusion:** The model fit indices revealed a good fit for the three-dimensional structure of the 18-item HPA-2-Tr scale. Reliability analysis showed that the scale is highly reliable in interpreting factors that affect hearing protection behaviors.

Keywords: Health promotion; noise-induced hearing loss; ear protective devices; occupational health; reliability and validity

ÖZET Amaç: Bu çalışma, "Hearing Protection Assessment (HPA-2)" ölçeğinin Türkçeye uyarlanmasını ve ölçeğin geçerlik ve güvenirlik özelliklerinin test edilmesini amaçlamaktadır. HPA-2 ölçeği, işçilerin işitme koruma davranışlarına ilişkin kişisel ve çevresel faktörlerle ilişkilendirilerek destekleri ve engelleri değerlendiren ekolojik modeli benimseyen bir ölçektir. Gürültüde çalışanların işitmesini korumak adına yapılan yasal düzenlemelere rağmen Türkiye'deki işçilerin işitme koruması kullanma sıklığı oldukça düşüktür. İşçilerin işitme koruma davranışlarının altında yatan faktörlerin incelenmesi, gürültü güvenli bir ortamı teşvik etmek amacıyla önemlidir. **Gereç ve Yöntemler:** HPA-2 ölçeği, Reddy ve ark. tarafından geliştirilen 5'li Likert tipi 18 maddeden oluşan bir ölçektir. HPA-2'nin Türkçeye uyarlanması iki dil uzmanı tarafından yapılmıştır. Ölçeğin güvenirlik ve geçerlik kanıtları için bir kesitsel çalışma tasarlanmıştır. Çalışmanın örneklemi, gürültülü iş yerlerinde çalışan amaca yönelik örnekleme ile seçilmiştir. Çalışmaya farklı endüstriyel alanlarda çalışan 423 işçi katılmıştır. Katılımcılara ilişkin bilgileri toplamak amacıyla araştırmacılar tarafından geliştirilen demografik veri formu kullanılmıştır. Son olarak, HPA-2-Tr katılımcılara uygulanmıştır. Yapı geçerliliği için açıklayıcı faktör analizi (AFA) ve doğrulayıcı faktör analizi sırasıyla IBM SPSS 25.0 ve AMOS 25.0 programları ile yapılmıştır. **Bulgular:** AFA sonuçlarına göre ölçeğin Türkçe uyarlamasında orijinal versiyonundan farklı olan 3 faktörlü bir yapı ortaya çıkmıştır. Model uyum indeksleri hesaplanmış ve elde edilen değerler (Karşılaştırmalı Uyum İndeksi=0,937, Uyum İyiliği İndeksi=0,900, yaklaşık hataların ortalama karekökü=0,068, Normlaştırılmış Uyum İndeksi=0,908 ve Tucker-Lewis İndeksi=0,926) kabul edilebilir aralıkta bulunmuştur. HPA-2-Tr'nin Kuder-Richardson 20 değeri 0,881, Spearman-Brown güvenilirlik katsayısı ise 0,915'tir. **Sonuç:** Model uyum indeksleri, HPA-2-Tr ölçeğinin 18 madde içeren 3 boyutlu yapısının iyi bir model uyumu gösterdiğini ortaya koymuştur. Ayrıca güvenirlik analizi sonuçları ölçeğin işitme koruması kullanımını etkileyen faktörleri yorumlamada oldukça güvenilir olduğunu göstermektedir.

Anahtar Kelimeler: Sağlık desteğinin geliştirilmesi; gürültüye bağlı işitme kaybı; kulak koruyucu cihazlar; iş sağlığı; güvenirlik ve geçerlik

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Long-term exposure to excessive occupational noise negatively affects workers' health.[1] Exposure to sound or noise above 85 dBA during an 8-hour shift can cause hearing loss, cardiovascular diseases, and non-auditory discomfort.[2,3] Therefore, the employer should provide hearing protection devices (HPDs) worn by employees to protect their health.[4,5] However, workers often do not comply with this recommendation and do not use HPDs, which can result in exposure to the combined effect of toxic gases and excessive noise in some industrial sectors (chemical and physical hazards).[6]

In research on the use of HPDs, two different trends can be observed in the literature.[7] These studies examine intrinsic factors related to hearing protection behaviour and use the health promotion model (HPM) to identify variables that predict HPD use. Studies based on the HPM focus on individual factors while ignoring the relationships between other possible factors that may influence this behaviour. Instead, it is predicted that adopting the ecological model in studies focusing on employee health would be more beneficial in examining employee behaviour and attitudes. This is because the interaction between the individual and the environment is essential for promoting and enhancing health. The ecological model reflects the interconnectedness of personal, interpersonal, and organizational factors.

Reddy et al. developed the HPA-2 scale, adopting the ecological model to identify personal and environmental factors influencing hearing protection behaviour.[8] The scale was applied to workers in noisy workplaces (such as factories) and identified supporting and preventing factors related to personal HPD use. These factors include a) risk justification (reasons for taking risks), b) HPD constraints (limitations caused by HPDs), c) hazard recognition (awareness of danger), d) behaviour motivation, and e) safety culture subdimensions.

Despite the legal regulations to protect the hearing health of employees exposed to noise, depending on their profession, the frequency of using hearing protectors by workers in our country is relatively low.[9,10] It is seen that it is quite essential to reveal the reasons for employees' behaviours to protect their hearing health and to create new incentive mechanisms. In this study, the HPA-2 scale, which will be adapted, is thought to be helpful in understanding and promoting hearing protection behaviour both in research and workplace applications. The scale provides practicality in terms of short response time and is suitable for the education level of employees.

MATERIAL AND METHODS

RESEARCH DESIGN AND SAMPLING

A cross-sectional study was designed to establish the evidence for the reliability and validity of the Turkish version of the HPA-2 scale. The target population/sample consisted of employees working in noisy workplaces and was selected by purposive sampling; the inclusion criteria of a participant were to be employed in a workplace exposed to noise levels of 85 dBA and above and willing to participate in the study. Accordingly, a demographic data sheet was formed by researchers to collect the data on participant's gender, age, education level, occupation, type of workplace, exposure time to noise, professional experience (in years), HPD training, use of HPD and type of HPD s/he use. After the final version of the HPA-2-Tr scale was developed, it was planned to reach a minimum of 400 participants for the study, considering the (1:10) rule for sample size. This research was conducted with 423 employees.

ETHICAL CONSIDERATIONS

This study was approved by the Başkent University Non-Invasive Clinical Research Ethics Committee with decision 23/08 dated January 18, 2023 and supported by the Başkent University Research Fund. It complied with the principles outlined in the Declaration of Helsinki. The participants were provided with necessary information about the research, and written informed consent was obtained from them.

INSTRUMENT

Construct validity of the Hearing Protection Assessment (HPA-2) scale was tested by exploratory factor analysis (EFA) that the structure of the questionnaire was built upon two scales: i) supports and ii) barriers in the use of HPDs.[8] Supports in the use of the HPD scale consisted of three subdimensions: Hazard

recognition, behaviour motivation, and safety culture, whereas subdimensions of risk justification and HPD constraints appeared under the barriers scale. The questionnaire includes 18 two-alternative forced-choice items ("yes" or "no"). The reliability of the scales was considered moderate (barriers: Cronbach α=0.74, supports: Cronbach α=0.77).

PROCEDURE

For the current study, we followed the steps of linguistic adaption for hearing-related questionnaires recommended by Hall et al.[11] Accordingly, permission to adapt HPA-2 was obtained from Dr. Ravi Reddy (2022-10-11) via e-mail, as no adaptation existed. Turkish translation of HPA-2 (HPA-2-Tr) was done by the corresponding author in the study. Original and translated questionnaires with an evaluation form were administered to two experts in linguistics. They examined the appropriateness of each item in the translated version of the questionnaire and commented on revisions if necessary. After revisions, the translated questionnaire was administered to two audiologists and a biostatistician employed in the Audiology Department at Başkent University. They evaluated the factor structure of the questionnaire and the appropriateness of items associated with each factor. They pointed out that the items related to supporting factors in HPD use (i.e., behaviour motivation, safety culture, and hazard recognition) could be gathered under the behaviour motivation subdimension. Finally, we administered the HPA-2-Tr to three workers to check the clarity of items and the readability of the questionnaire. They completed the questionnaire in 10-12 minutes and declared they had no difficulty completing it. The final version of HPA-2-Tr was implemented in a larger sample to study the validity and reliability of the new instrument (Appendix 1).

DATA COLLECTION

Data was collected in Ankara and Tekirdağ due to convenience. The data collectors were trained to introduce the research purpose, encourage participants' willingness to participate, and administer the consent form (where to sign), demographic data sheet, and HPA-2-Tr. We produced a standard procedure text for each data collector to follow, and an observer always accompanied the data collection process to control the internal reliability threat of data collector bias.

DATA ANALYSIS

Statistical data analysis was performed using IBM SPSS 25.0 and IBM SPSS AMOS 25.0 (SPSS Statistics Version 25.0. IBM Corp., Armonk, NY). Descriptive statistics are summarized in numbers and percentages.

Reliability Analysis

For the reliability analysis of the HPA-2-Tr, the Kuder-Richardson 20 (KR-20) value and Spearman-Brown reliability coefficient were calculated.

Explanatory and Confirmatory Factor Analyses

The construct validity of the HPA-2-Tr was conducted with EFA and confirmatory factor analysis (CFA). The Kaiser-Meyer-Olkin (KMO) value and anti-image correlation matrix were used to examine the appropriateness of the scale for factor analysis. The diagonal values of the inverse of the correlation matrix were evaluated to determine whether the data had a multicollinearity problem. The appropriateness of the HPA-2-Tr scale to the factorable structure was examined with the determinant value of the correlation matrix and Bartlett's test. The principal components method and varimax rotation method were used in EFA, and values above 0.30-factor load were considered. Kaiser's eigenvalue criterion was used to determine the number of factors. CFA was used to confirm the factor structure of the HPA-2-Tr scale. In the evaluation of model goodness of fit, the ratio of chi-square value to degrees of freedom (χ^2/df), root mean square error of approximation (RMSEA), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Normed Fit Index (NFI), and Tucker-Lewis Index (TLI) were used.

RESULTS

This research was conducted with a total of 423 employees who had already been recruited in noisy workplaces (>85 dBA), including 41 female (10%) and 382 male (90%) participants, and their mean age was 36.88±10.21 years. The descriptive results are presented in Table 1. Among the participants, 147

APPENDIX 1: Turkish Version of Hearing Protection Assessment (HPA-2-Tr) Scale.

İşitme Koruma Değerlendirmesi (HPA-2-Tr) Ölçeği

YÖNERGE: *Bu çalışmada gürültülü işyerlerinde, çalışanların işitme sağlığını korumaya yönelik tutum ve davranışları incelenmektedir. Size uygun olan ifadeleri kutucuk içine* ***"X"*** *koyarak işaretleyiniz. Katılımınız için teşekkür ederiz.*

A **Lütfen aşağıda verilen ifadeleri dikkatlice okuyarak sizin için en doğru olanı seçiniz:**
Lütfen a ya da b seçeneğinden sadece birini işaretleyiniz.
❑ **a.** Çalışırken **güvenlik** benim için ön plandadır.
❑ **b. Güvenlik** önemlidir, ancak diğer faktörler bazen güvenli bir şekilde çalışmamı sınırlar.

B **Lütfen aşağıda verilen ifadeleri dikkatlice okuyarak sizin için en doğru olanı seçiniz:**
Lütfen a ya da b seçeneğinden sadece birini işaretleyiniz.
❑ **a.** İnsanlar **güvenliğe** yeterince önem vermedikleri için iş yerinde yaralanmalar meydana gelir.
❑ **b.** İnsanlar işyeri yaralanmalarını ne kadar önlemeye çalışsalar da yaralanmalar her zaman meydana gelecektir.

C **İş yerinde kullanmak için kulak tıkacım ve/veya koruyucu kulaklığım var.** ❑ Evet ❑ Hayır

D **İş yerinde gürültü olduğunda kulak tıkacı ve/veya koruyucu kulaklık takıyorum.**
(Lütfen sadece bir işaretleme yapınız.)

❑ Her Zaman	❑ Neredeyse Her Zaman	❑ Genellikle	❑ Sıklıkla	❑ Bazı Zamanlar	❑ Nadiren / Hiçbir Zaman

E Aşağıda kalın (koyu) harflerle yazılan cümleyi okuyarak 1-9 arasındaki maddelere "Evet" ya da "Hayır" kutucuklarından birini işaretleyerek cevap veriniz.

	İşyerinde kulak tıkacı ya da koruyucu kulaklık <u>kullanıyorsanız</u>, bunun nedeni:	**Evet**	**Hayır**
1	İşvereninizin size kulak tıkacı ya da koruyucu kulaklık takmanızı söylemesidir.	❑	❑
2	Gürültülü bir iş yapıyor olmanızdır (örneğin; gürültülü makine üzerinde çalışmak, demir dövmek, çekiç vurmak, vb.).	❑	❑
3	Diğer çalışanların yakınınızda gürültülü iş yapıyor olmalarıdır (örneğin; gürültülü makine üzerinde çalışmak, demir dövmek, çekiç vurmak, vb.).	❑	❑
4	İşitme sağlığınızı korumak istemenizdir.	❑	❑
5	İşyerindeki gürültüden rahatsız olmanızdır.	❑	❑
6	Ailenizle iyi bir hayat yaşamak için işitme sağlığınızın iyi olmasını istemenizdir.	❑	❑
7	İş arkadaşlarınızın size kulak tıkacı ya da koruyucu kulaklık takmanız gerektiğini hatırlatmalarıdır.	❑	❑
8	İşyerinizin kulak tıkacı ve koruyucu kulaklık kullanımı ile ilgili kurallarının olmasıdır.	❑	❑
9	Kulak tıkacını ya da koruyucu kulaklığı nasıl takacağınız ile ilgili eğitim almanızdır.	❑	❑
	Diğer, lütfen açıklayınız:	❑	❑

F Aşağıda kalın (koyu) harflerle yazılan cümleyi okuyarak 10-18 arasındaki maddelere "Evet" ya da "Hayır" kutucuklarından birini işaretleyerek cevap veriniz.

	(İşyerinde) Gürültüye maruz kaldığınızda kulak tıkacı ya da koruyucu kulaklık <u>kullanmıyorsanız</u>, bunun nedeni:	**Evet**	**Hayır**
10	Kulak tıkacını ya da koruyucu kulaklığı hangi durumlarda takmanız gerektiği konusunda yeterli bilgiye sahip olmamanızdır.	❑	❑
11	İşinizi yapmak için örneğin uyarı sinyalleri, makine performansı ve benzeri sesleri yeterince iyi duyamıyor olmanızdır.	❑	❑
12	Diğer çalışanlarla yeterince iyi iletişim kuramıyor olmanızdır.	❑	❑
13	Kulak tıkacı ya da koruyucu kulaklık takmak sizin için rahatsız edicidir.	❑	❑
14	Kulak tıkacının ya da koruyucu kulaklığın, kullandığınız diğer güvenlik ekipmanlarının önüne geçiyor olmasıdır.	❑	❑
15	İşyerinde gürültüye alışmış olmanızdır.	❑	❑
16	İş arkadaşlarınızın kendi işitme koruyucularını sıklıkla takmamasıdır.	❑	❑
17	İş arkadaşlarınızın işitme koruyucusu taktığınızda sizinle dalga geçmesidir.	❑	❑
18	İşyerinde aynı ortamda çalıştığınız diğer çalışanların size haber vermeden gürültülü bir iş yapmasıdır.	❑	❑
	Diğer, lütfen açıklayınız:	❑	❑

TABLE 1: Descriptive results of demographic data form.

	n (%)
Gender	
Female	41 (10)
Male	382 (90)
Educational level	
Primary	77 (18)
Secondary	209 (50)
Vocational school	65 (15)
University	72 (17)
Industry	
Automotive	147 (35)
Health	109 (26)
Manufacturing	157 (37)
Others (textile, electronics)	10 (2)
Job experience in noisy workplaces	
0-2 years	93 (22)
3-5 years	86 (20)
6 years and above	244 (58)
Daily noise exposure	
0-2 hours	53 (13)
3-5 hours	72 (17)
6-8 hours	297 (70)
Hearing protection training	
Yes	291 (69)
No	132 (31)
Type of preferred hearing protection	
Ear caps	27 (8)
Earplugs	161 (49)
Earmuff	73 (22)
Earplugs and earmuff	67 (21)
Use of hearing protection	
Yes	274 (65)
No	147 (35)
Frequency of hearing protection usage	
Rarely or never	136 (32)
Sometimes	112 (27)
Often	6 (1)
Usually	64 (15)
Almost always	34 (8)
Always	71 (17)

people work in automotive (35%), 109 in health (26%), 157 in manufacturing (37%), and 2% in other fields. Half of the employees had a degree in secondary education, and 58 percent of participants had more than 6 years of experience in an industrial field. Seventy percent of participants were exposed to noise higher than 85 dBA for 6-8 hours. Most participants got training on hearing protection (69%), whereas 65 percent of employees declared that they use HPDs while working. However, only seventeen percent of them always used HPDs.

The framework of the original HPA-2 consisted of five subdimensions, as reported. Similarly, the EFA was conducted in the current study to obtain construct validity-related evidence for HPA-2-Tr. In addition, CFA was conducted consecutively. Tabachnick and Fidell recommended that the sample size be at least 300, whereas Hair et al. suggested that more than 100 cases were required to conduct EFA.[12,13] The KMO value was found to be 0.905, and the diagonal values of the anti-image correlation matrix were obtained above 0.5, indicating that the sample size was sufficient to conduct EFA. Bartlett's sphericity test result χ^2= 4076.09 (sd=153); p<0.001 was obtained, and the determinant value of the correlation matrix was close to zero, indicating that the scale was appropriate for the factorable structure. When the diagonal values of the inverse of the correlation matrix of the HPA-2-Tr were examined, no multicollinearity was observed between the variables.

In determining factors of the scale according to Kaiser's eigenvalue criterion, three factors were yielded with an eigenvalue greater than 1. The three-factor structure was obtained using the principal component analysis and the varimax rotation method, and the total explained variance was obtained as 61.64%. Similar to the original HPA-2 scale, the first factor of HPA-2-Tr was named "Behaviour Motivation", the second was "HPD Constraints", and the third was "Risk Justification" after taking experts' opinions about the results. The final factor structure of HPA-2-Tr scale is presented in Table 2.

The covariances between the error terms of the 2nd and 3rd items, 4th and 6th items in the first factor, and between the 11th and 12th items in the second factor were corrected. Model fit indices were calculated, and values (χ^2/df=2.942, CFI=0.937, GFI=0.900, RMSEA=0.068, NFI=0.908, and TLI=0.926) were within acceptable range (Table 2). When model fit indices were evaluated due to CFA, the HPA-2-Tr scale consisting of 18 items was confirmed with a 3-factor structure (Figure 1).

TABLE 2: Explanatory and confirmatory factor analysis results of the HPA-2-Tr scale.

Items (n=423)	$\bar{X}$	SD	Corrected item-total correlation	Pooled variance	F1	F2	F3
F1: Behaviour Motivation (Eigenvalue: 6.376; Variance explained: 35.424; Kuder-Richardson 20: 0.93)							
I1: Boss reminds to wear HPDs	1.44	0.497	0.496	0.503	0.700		
I2: Doing a noisy job	1.32	0.468	0.664	0.729	0.836		
I3: Other workers doing noisy jobs	1.32	0.467	0.643	0.717	0.838		
I4: To protect hearing	1.22	0.418	0.622	0.728	0.833		
I5: Noise is causing annoyance	1.29	0.452	0.641	0.726	0.834		
I6: Hearing preservation to maintain healthy family	1.26	0.438	0.630	0.701	0.835		
I7: Workmates remind to wear HPDs	1.55	0.498	0.526	0.636	0.640		
I8: Workplace rules	1.34	0.473	0.619	0.692	0.819		
I9: Receipt of training	1.36	0.482	0.603	0.686	0.818		
F2: HPD Constraints (Eigenvalue: 3.550; Variance explained: 19.720; Kuder-Richardson 20: 0.756)							
I11: Cannot hear machine	1.54	0.499	0.472	0.579		0.713	
I12: Communication	1.54	0.499	0.409	0.599		0.753	
I13: HPDs are uncomfortable	1.62	0.485	0.365	0.564		0.695	
I14: HPDs get in the way of safety gear	1.73	0.445	0.457	0.503		0.456	
F3: Risk Justification (Eigenvalue:1.169; Variance explained: 6.496; Kuder-Richardson 20: 0.758)							
I10: Not clear when to wear	1.72	0.450	0.289	0.327			0.549
I15: Used to not wearing HPDs	1.55	0.498	0.392	0.547			0.355
I16: Co-workers do not wear HPDs	1.72	0.451	0.392	0.572			0.705
I17: Co-workers find HPDs funny	1.86	0.344	0.472	0.647			0.776
I18: Co-workers doing a noisy job without warning	1.75	0.434	0.476	0.600			0.707
Model Fit Indexes							
χ^2 (df)	χ^2/(df)	CFI	GFI	RMSEA	NFI	TLI	
379.489 (129)	2.942	0.937	0.90	0.068	0.908	0.926	

HPA-2: Hearing Protection Assessment; SD: Standard deviation; HPDs: Hearing protection devices; df: Degree of freedom; CFI: Comparative Fit Index; GFI: Goodness of Fit Index; RMSEA: Root mean square approximation error; NFI: Normed Fit Index; TLI: Tucker-Lewis Index.

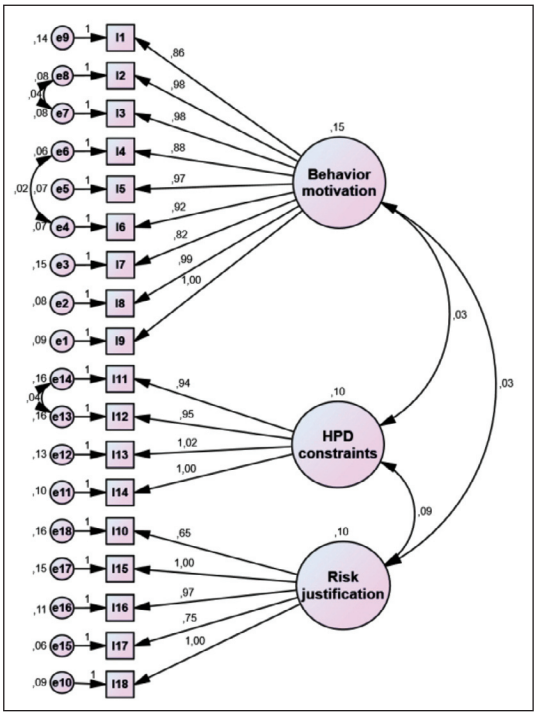

FIGURE 1: Confirmatory factor analysis model of the HPA-2-Tr.
HPA: Hearing Protection Assessment; HPDs: Hearing protection devices.

When the reliability analysis of the HPA-2-Tr scale was examined, the KR-20 value was found to be 0.881, which is considered reliable. For each sub-factor of the scale, the KR-20 values were 0.930 for "F1: Behaviour Motivation", 0.756 for "F2: HPD Constraints", and 0.758 for "F3: Risk Justification" (Table 2). The split-half method obtained high reliability with the Spearman-Brown reliability coefficient of 0.915. Reliability coefficients for three subdimensions were calculated as 0.924 for F1, 0.804 for F2, and 0.787 for F3.

DISCUSSION

The ecological model adopted in HPA-2 divides employers' behaviour into 3 levels: intrapersonal, interpersonal, and organizational. According to the original framework, supports and barriers scales are divided into several subdimensions. However, the distribution of items showed a different pattern in the Turkish setting. The results revealed no clear cut be-

tween the abovementioned levels for employers in noisy workplaces, as suggested by the ecological model. Especially in the behaviour motivation dimension, intrinsic (being aware of noise is hazardous for health, having a healthy life, being trained) and extrinsic (co-workers and boss) sources of motivation are interwoven to support hearing protection.

EFA results revealed that a three-factor structure better explained the scale than the original five-factor structure. The CFA was conducted for the Turkish adaptation of the scale model fit indices, which show values within acceptable limits for the three-factor structure. The original scale's safety culture, hazard recognition, and behavioral motivation subscales were not separated in Turkish culture and were combined under a single subscale. The study used internal consistency and split-half test methods to examine the scale's reliability. The KR-20 internal consistency coefficient was 0.881, similar to the original scale result. The KR-20 internal consistency coefficient was 0.881, similar to the original scale result (α=0.80).[8] Also, the split-half reliability coefficient was a high value. These results support the HPA-2-Tr as a reliable measurement tool.

It has been stated that the safety climate may be perceived differently across nations and cultures.[14,15] Although the fundamental laws that constitute the corporate culture in our country are very similar to Western laws, there are insufficiencies in control and enforcement in practice.[9,16] The relationship between employees' perception of the importance of safety at the organizational level and risk-taking behaviours differs across cultures.[17] It is also stated that the effects of noise on health are not well understood by employees and employers in our country.[9] The organizational, interpersonal, and intrapersonal factors affecting workers' use of hearing protection in our country were not differentiated due to the lack of experience and knowledge that created these conditions. Since the concept of behavioral motivation is a term that covers both internal and external factors that influence and guide an individual's actions and choices, it was deemed appropriate to name this factor, which also includes the items safety culture and hazard recognition, as behavioral motivation.

Studies conducted using this scale will determine the factors that support and barrier the use of hearing protection by individuals working in noisy workplaces in Türkiye. In this way, the results of studies using HPA-2-Tr scale can be used to identify the priorities on which interventions should focus for hearing protection in this population. Low- and middle-income countries, as well as some countries with very high rates of occupational hearing loss, such as Africa, have different requirements for hearing protection in noisy workplaces compared to Western cultures.[18,19] Additionally, HPDs may be related to financial concerns in some cultures. A qualitative study with Latino construction workers reported that Latino workers need employment, desire acceptance in their environment, and are more willing to work in unsafe conditions.[20] Culturally specific identification of these factors is crucial and may require culture-specific intervention programs, such as those addressing linguistic and educational level diversity.[21] Studies with HPA-2-Tr scale in our country can provide fundamental information for developing intervention programs specific to our culture. Considering the non-audiological effects of noise, including hearing problems, cardiovascular diseases, sleep problems, and cognitive problems, the importance of research on this subject with specific measurement tools becomes more prominent.[22]

This study has some limitations. Although individuals from different socio-economic and educational levels were included in the study, the data were limited to Ankara province in the Central Anatolia region and Tekirdağ province in the Marmara region of Türkiye. The sample may not be viewed as a wholly representative of workers in noisy workplaces throughout Türkiye. Many factors influence the health behaviour of a society. For this reason, it has been reported that differences in health behaviour can be observed not only between countries but also within regions and among socio-economic groups within those regions.[23] Although no studies have examined the regional variations in noise behaviour within our country, it is prudent to consider that a similar effect might exist in noise protection as in general health behaviour.

Furthermore, in recent years, Türkiye has been one of the countries receiving the highest number of

migrants from many countries, primarily from Syria. Due to language and educational barriers, similar to challenges in other countries around the world, migrants in Türkiye often work in more hazardous jobs, and their occupational health and safety training is often neglected.[24,25] Since these factors can affect perceived health behaviour, it is recommended to investigate how they might impact the structure of this scale within that population. In addition, as there are no other Turkish measurement tools with a similar structure that assess the factors influencing the use of hearing protection among individuals working in noisy workplaces, an examination of convergent validity was not possible in this study.

The study produced data supporting that the HPA-2-Tr scale is a valid and reliable measurement tool with a three-factor structure. The scale can be used to determine the factors that support and prevent the use of hearing protection in individuals working in noisy workplaces in the Turkish population.

CONCLUSION

Hearing protection behaviour is crucial to conserving employees' health and safety in noisy workplaces. Hence, the HPMs depict different levels of interaction, intrapersonal and interpersonal, that support or prevent an individual's hearing protective behavior. The HPA-2 scale revealed 5 factors related to supports and barriers for hearing protection: i) risk justification, ii) HPD constraints, iii) hazard recognition, iv) behavior motivation, and v) safety culture. The HPA-2-Tr scale is a valid and reliable measurement tool with a three-factor structure that revealed cultural differences compared to the original scale: i) risk justification, ii) HPD constraints, and iii) behavior motivation. The organizational, interpersonal, and intrapersonal factors affecting workers' use of hearing protection in Türkiye were not differentiated due to the lack of experience and knowledge about these factors. Culturally specific identification of factors related to hearing protection is crucial and may require culture-specific intervention programs, such as those addressing linguistic and educational level diversity. Studies with HPA-2-Tr scale can provide fundamental information for developing intervention programs specific to Turkish culture.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Kübra Özmen;* ***Design:*** *Kübra Özmen, Eda Çakmak;* ***Control/Supervision:*** *Kübra Özmen;* ***Data Collection and/or Processing:*** *Kübra Özmen, Eda Çakmak;* ***Analysis and/or Interpretation:*** *Kübra Özmen, Eda Çakmak, Merve Deniz Sakarya;* ***Literature Review:*** *Kübra Özmen, Merve Deniz Sakarya;* ***Writing the Article:*** *Kübra Özmen, Eda Çakmak, Merve Deniz Sakarya;* ***Critical Review:*** *Kübra Özmen;* ***References and Fundings:*** *Kübra Özmen.*

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