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VALIDATION AND RELIABILITY OF AN INSTRUMENT TO ASSESS NOISE-INDUCED HEARING LOSS KNOWLEDGE, ATTITUDES, AND PRACTICES IN EXPOSED WORKERS

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Abstract
A quantitative, descriptive, non-experimental study was conducted to determine the validity and reliability of an instrument that assesses the knowledge, attitudes, and practices of workers exposed to noise-induced hearing loss. The study was conducted in three phases: a systematic review of the scientific literature, construction of the instrument, validity, and reliability. The systematic review using the PRISMA methodology included 19 articles that supported the construction of the theoretical construct for the elaboration of the items of the instrument constituted in its post-validation version by 36 items in the dimensions of knowledge, attitudes, and practices. The statistical program Microsoft Excel 19.0 was used to validate the instrument, and the R Core Team Statistical Program, R-Studio, version 4.2.1, and a single coding based on SPSS Version 24 were used to calibrate the instrument. Content validity by expert judges obtained an overall CVI 0.77 (CVI knowledge 0.91, attitudes 0.89, practices 0.91) and statistical reliability by Cronbach's Alpha coefficient showed overall internal consistency 0.77 (knowledge 0.82, attitudes 0.80, practices 0.70). The validity and reliability results indicate that the instrument is acceptable, according to the objectives and scope of this research.

Keywords: noise-induced hearing loss, knowledge, attitudes, practice.

1. Introduction

Noise-induced hearing loss (NIHL) is one of the most frequently reported occupational diseases in many studies and contributes to 16% of hearing loss among adults worldwide, ranging from 7% to 21% in various subregions and more in developing countries (Lie et al., 2016). Its prevalence and incidence among noise-exposed workers vary by industry and occupation, with mining, manufacturing, and related occupations consistently having higher prevalence, incidence, and adjusted risk of hearing loss (Themann & Masterson, 2019).

NIHL primarily affects an individual's ability to interact both at work and socially, directly affecting their quality of life. These difficulties are easily underestimated by the worker and go unnoticed in most of those who perform their function in noisy environments (Anacona, Lilian; González, Nancy and Vela, 2016). In companies, the exposure of workers to noise is kept under surveillance, performing periodic measurements of environmental noise to establish necessary control measures through epidemiological surveillance programs (Ministerio de la Protección Social, 2007). Workers' perceptions and knowledge of occupational health risks are rarely evaluated in work-related injury and disability prevention programmes. Risk perception is thus a predictor of worker safety behaviors, and underestimation of objective risk has been shown to be proportional to the likelihood of accidents and illnesses. However, research on how workers perceive, recognize, and react to risks in different occupational settings remains limited (Thepaksorn et al., 2018).

Internationally, studies have been found on the Knowledge, Attitudes and Practices (KAP) of workers regarding noise-induced hearing loss, in which previously adapted and validated KAP questionnaires have been administered, such as the research of Rus et al. (2008), which found overall average scores in Knowledge and Attitudes below the satisfactory level and in practices, notably low scores, concluding the need to implement educational programs to educate workers in order to improve their knowledge, attitude, and practice towards noise in the workplace and optimize prevention programs (Rus et al., 2008). At the country and Caribbean regional level, there are no studies related to the use of instruments that measure the knowledge, attitudes, and practices of workers regarding noise-induced hearing loss. Therefore, the purpose of this study was to determine the validity and reliability of an instrument aimed at workers exposed to noise and thus obtain a baseline so that the KAP questionnaires can be applied pre- or post-intervention for preventive programs in PAIR, which will contribute to the consolidation of epidemiological surveillance programs.

2. Materials and Methods

The research was framed under a quantitative approach, with a non-experimental, descriptive design (Hernández Sampieri et al., 2014), since it sought to design an instrument in which the general and substantive theories that support the research were defined and the items were constructed according to dimensions determined by the literature and previous research in order to subsequently apply validity and reliability tests.

The study was developed in three phases: systematic review of the scientific literature (phase I): PICO question formulation, MeSH search terms (Hearing Loss, Hearing Loss Noise-Induced and Health Knowledge, Attitudes, Practice, CAP, Workers), Boolean operators (AND and OR), filters applicable to the search, and databases in which the search exercise was performed (PubMed, Scopus, Science Direct, Scielo) according to the inclusion criteria (studies of workers exposed to occupational noise, under 60 years of age; experimental, correlational, analytical studies of the last 5 years; in Spanish, English, or Portuguese), excluding those related to non-occupational noise exposure. Articles were selected and screened based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. With the terms, operators, and filters established, combinations were made in the selected databases, first performing a general search and then a more specific search. The titles and abstracts were analyzed according to the inclusion and exclusion criteria, and then the texts were analyzed in full to identify the contributions of these studies to the review question.

Based on the documentary review, general criteria were established for the construction of the instrument (phase II), defining variables and dimensions, establishing key points that would serve as a starting point for defining the indicators, and thus forming a first set of items with response options adjusted to a Likert measurement scale.

The content of the questionnaire was validated through expert judgments (speech therapists specializing in audiology, physicians specializing in occupational medicine, or speech therapists with

specialization or master's degree in OSH, all with extensive experience in the area of Occupational Safety and Health). A validation matrix was created containing all items of the initial instrument. The judges assessed the relevance of each item, using the scale "Indispensable," "Useful but not indispensable" and "Useless and not indispensable," as well as the intelligibility of the item using the scale "Intelligible" and "Not intelligible," thus rating aspects of content (theoretical dimension of the construct, selection of items, etc.), form and style (wording of the items, comprehension by the target population, among others). For the content validation analysis (phase III), Lawshe's model (1975), modified by Tristán (2008), was considered in which the Content Validity Ratio (CVR) and Content Validity Index (CVI) of the entire instrument were established (Espinosa Díaz & Llorens Baez, 2015). After validation by experts, a second draft of the items was prepared to make up the final version of the instrument.
Finally, the internal consistency of the instrument was analyzed, i.e., the correlation between the questions of each dimension and thus determine the reliability of the instrument (phase III), through the application of Cronbach's Alpha coefficient (Mangelsdorff et al., 2013).
To validate the instrument, CVR and CVI values were determined using Microsoft Excel. For the calibration of the instrument, the R Core Team Statistical Program was used under the R-Studio development environment, version 4.2.1, and unique coding based on SPSS was used. The respective descriptive analyses per item, comparisons, and calibration of the instrument were tested using both software programs to ensure that all analyses agreed with the context. Specific tests, such as Cronbach's alpha, were run to calculate the statistical reliability of the instrument and the internal consistency of the test.

3. Results

The results of the systematic review, validation, and reliability of the designed instrument based on the objectives of the study are described.

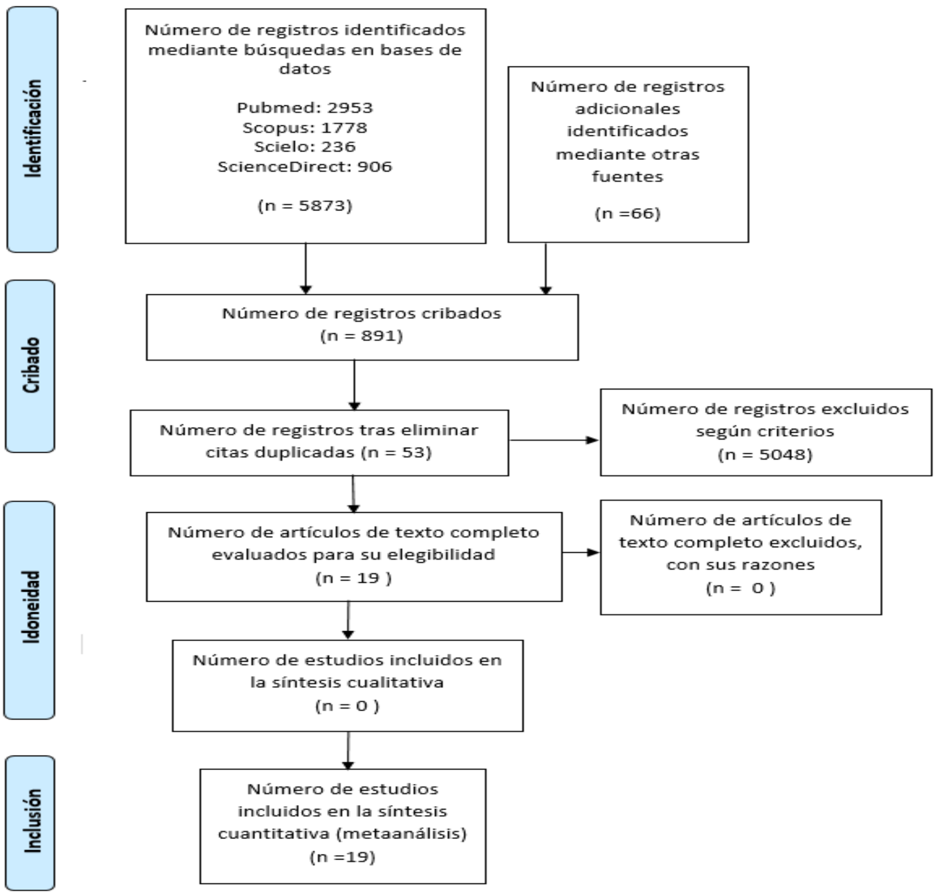

Figure 1. Flow diagram of the process of defining the items included in the study

Figure 1 summarizes the process of identification, screening, suitability assessment, and selection of the included articles. The 19 articles included were characterized because most were published in 2020 (21%), 2017, and 2019 (15% for each year), originating from countries such as Malaysia, South Africa, India, and Brazil; in the English language (68%), Spanish (21%), and two articles in Portuguese (11%), with a cross-sectional design (84%), integrating three review articles (16%). It was found that seven articles (37%) presented specific instruments that assessed knowledge, attitudes, and practices regarding noise or noise-induced hearing loss in workers as a whole (CAP questionnaires) and also found articles related to the worker's perception or susceptibility. Based on the contributions or benefits of the included articles, key points were highlighted that led to the development of indicators and structuring of the instrument's items. The structure of the questionnaire applied by Basheer et al. (2019), which was taken as the Gold Standard, was considered for the construction of the instrument items.

In Table 1, in the variable Knowledge, it is evident that Items 4, 10, 11, 12, 13, and 14 were valued with the maximum validity score of the questionnaire, that is, 1.00; Items 2 and 3 obtained a value greater than the acceptable value (CVR ≥ 0.58), while Items 5, 6, 7, 8, and 9 showed a lower value. For Attitudes, only item 19, referring to treatment, obtained a score lower than acceptable (0.58), which was reformulated. On the other hand, items 16, 17, 18, and 23 had scores higher than the acceptable value (CVR ≥ 0.58), and items 15, 20, 21, 22, 24, 25, 26, 28, and 29 were rated with the maximum validity score of the questionnaire (1.00). In the Practices variable, it can be observed that all the items of this variable and dimension (prevention) obtained an acceptable value (CVR ≥ 0.58), noting that items 30, 31, 33, 33, 34, 35, and 38 reached the maximum validity score of the questionnaire (1.00).

A Content Validity Index (CVI) was obtained for the variables Knowledge 0.91, Attitudes 0.89, and Practices 0.91, indicating an acceptable value.

Table 1. Instrument content validity ratio

Variable Conocimientos							
Dimensión	**Indicadores**	**Ítems**	**Indispensable**	**Útil pero no indispensable**	**Inútil y no indispensable**	**CVR**	**CVR'**
Aspectos generales sobre el ruido	Exposición a ruido y pérdida auditiva	1	4	2	0	0,33	0,67
	El ruido laboral y pérdida auditiva	2	5	1	0	0,67	0,83
	Ocurrencia de la PAIR	3	5	0	1	0,67	0,83
		4	6	0	0	1,00	1,00
		5	3	0	3	0,00	0,50
Causas de la pérdida auditiva	El ruido no laboral y pérdida auditiva	6	3	3	0	0,00	0,50
Factores de riesgo	Riesgo de PAIR en hombres	7	1	3	2	-0,67	0,17
Signos y síntomas de la PAIR	Secreción de oído como signo de PAIR	8	2	3	1	-0,33	0,33
Tratamiento	Tratamiento de la PAIR	9	2	2	2	-0,33	0,33
	Reversibilidad de la PAIR	10	6	0	0	1,00	1,00

Prevención	Uso de protectores auditivos	11	6	0	0	1,00	1,00
Normatividad	Ley de protección contra el ruido	12	6	0	0	1,00	1,00
	Responsabilidad para la dotación de protectores auditivos	13	6	0	0	1,00	1,00
	Responsabilidad del uso de protectores auditivos	14	6	0	0	1,00	1,00
Variable Actitudes							
Dimensión	**Indicadores**	**Ítems**	**Indispensable**	**Útil pero no indispensable**	**Inútil y no indispensable**	**CVR**	**CVR'**
Aspectos generales sobre el ruido	Exposición a ruido y pérdida auditiva	15	6	0	0	1,00	1,00
	Habituación al ruido	16	5	1	0	0,67	0,83
	Exposición a ruido y pérdida auditiva	17	4	2	0	0,33	0,67
Causas de la pérdida auditiva	Reversibilidad de la pérdida auditiva	18	5	1	0	0,67	0,83
Tratamiento	Tratamiento de la pérdida auditiva	19	3	2	1	0,00	0,50
Prevención	Importancia de las medidas preventivas	20	6	0	0	1,00	1,00
	Uso de protectores auditivos	21	6	0	0	1,00	1,00
		22	6	0	0	1,00	1,00
Actitud frente a la exposición a ruido	Importancia del uso de protectores auditivos	23	5	1	0	0,67	0,83
	Evaluación periódica de la audición	24	6	0	0	1,00	1,00
	Reporte al empleador	25	6	0	0	1,00	1,00
	Formación y educación	26	6	0	0	1,00	1,00
	Conocimiento de la normatividad en SST	27	5	1	0	0,67	0,83
		28	6	0	0	1,00	1,00

	Importancia del uso de protectores auditivos	29	6	0	0	1,00	1,00
Variable Prácticas							
Dimensión	**Indicadores**	**Ítems**	**Indispensable**	**Útil pero no indispensable**	**Inútil y no indispensable**	**CVR**	**CVR'**
Prevención	Uso de protectores auditivos	30	6	0	0	1,00	1,00
	Evaluación periódica de la audición	31	6	0	0	1,00	1,00
	Evitación del ruido no laboral	32	4	2	0	0,33	0,67
	Implementación de medidas protectoras	33	6	0	0	1,00	1,00
	Reporte al empleador	34	6	0	0	1,00	1,00
	Evaluación periódica de la audición	35	6	0	0	1,00	1,00
		36	5	1	0	0,67	0,83
	Formación y educación	37	5	1	0	0,67	0,83
		38	6	0	0	1,00	1,00

Based on the analysis, post-validation adjustments were made, and items were eliminated and modified given their weak scores in the validation by experts. The final version of the questionnaire consisted of 36 items grouped into 20 indicators and five dimensions (Table 2).

Table 2. Final operationalization of the variables

Variable	**Dimensiones**	**Indicadores**	**Ítems**	**Total de ítems**
Conocimientos	Aspectos generales sobre ruido y pérdida auditiva	Exposición a ruido y pérdida auditiva	1	13 ítems
		El ruido laboral y pérdida auditiva	2	
		Ocurrencia de la PAIR	3, 4	
		El ruido no laboral y pérdida auditiva	5	
	Signos y síntomas de la PAIR	Zumbidos en el oído como síntoma de PAIR	6	
	Tratamiento	Tratamiento de la PAIR	7	
		Reversibilidad de la PAIR	8	
	Prevención	Protectores auditivos como medida de prevención	9	
		Responsabilidad de la dotación de protectores auditivos	10	
		Responsabilidad del uso de protectores auditivos	11	

		Evaluación periódica de la audición	12	
		Ley de protección para el ruido	13	
Actitudes	Aspectos generales sobre la PAIR	Habituación al ruido	14, 15	14 ítems
		Exposición a ruido y pérdida auditiva	16, 17	
	Tratamiento	Reversibilidad de la PAIR	18	
	Prevención	Importancia de las medidas preventivas	19	
		Uso de protectores auditivos	20, 21, 22, 23	
		Evaluación periódica de la audición	24	
		Reporte al empleador	25	
		Formación y educación	26	
		Conocimiento de la normatividad en SST	27	
Prácticas	Prevención	Uso de protectores auditivos	28	9 ítems
		Evaluación periódica de la audición	29, 33, 34	
		Evitación del ruido de tipo no laboral	30	
		Implementación de otras medidas protectoras	31	
		Reporte al empleador	32	
		Formación y educación	35, 36	

Table 3 shows the Cronbach's Alpha, the Guttmans Lambda 6, the mean correlation between items, and the median correlation between items, showing that in the Knowledge variable, an overall Cronbach's alpha coefficient of 0.82 and >0.70 was obtained for each of the 13 items (minimum acceptable Alpha value= >0.70), which shows an acceptable internal consistency. Likewise, a 95% confidence interval (CI) was found (0.81, 0.82), an overall Lambda 6 value of 0.81 and for each item greater than 0.70 (minimum acceptable value= >0.70). In addition, an average item correlation of 0.37 was obtained, with a median of 0.40 (minimum acceptable value >0.3), indicating that all items have something in common.

The Attitudes variable shows an overall Cronbach's Alpha coefficient of 0.80 and >0.70 for the 14 items, showing acceptable internal consistency. Similarly, the Lambda 6 value was 0.75, which corroborates the internal consistency of this variable. The confidence interval (CI) was 95% (0.79, 0.81) and the mean correlation of the items was 0.62 with a median of 0.59.

With respect to the practices variable, an overall Cronbach's alpha coefficient of 0.70 is shown, which evidences acceptable internal consistency. A Lambda 6 value of 0.69 was found, lower than the minimum acceptable, a confidence interval (CI) of 95% (0.68, 0.71). In addition, a mean item correlation of 0.52 was obtained, with a median of 0.49, indicating that all the items are directed in the same direction and are related to each other.

Table 3. Reliability of the Instrument items

Ítem	Alfa de Cronbach si se elimina el elemento	Lambda 6 Guttmans G6 (smc)	Average_r	Mediana de la correlación
Variable Conocimientos				
1	0.80	0.79	0.37	0.40
2	0.80	0.79	0.36	0.42
3	0.80	0.70	0.35	0.39
4	0.81	0.80	0.38	0.38
5	0.80	0.79	0.36	0.35
6	0.79	0.78	0.35	0.38
7	0.81	0.78	0.35	0.36
8	0.82	0.78	0.34	0.36
9	0.85	0.79	0.33	0.37
10	0.81	0.80	0.39	0.38
11	0.81	0.80	0.38	0.40
12	0.80	0.79	0.37	0.45
13	0.84	0.78	0.36	0.45
General	**0.82**	**0.81**	**0.37**	**0.40**
Variable Actitudes				
Ítem	**Alfa de Cronbach si se elimina el elemento**	**Lambda 6 Guttmans G6**	**Average_r**	**Mediana de la correlación**
14	0.74	0.74	0.54	0.60
15	0.74	0.74	0.58	0.61
16	0.77	0.75	0.57	0.62
17	0.75	0.75	0.45	0.59
18	0.75	0.75	0.54	0.59
19	0.74	0.76	0.61	0.50
20	0.78	0.74	0.62	0.54
21	0.78	0.72	0.54	0.58
22	0.78	0.72	0.54	0.59
23	0.79	0.71	0.55	0.60
24	0.75	0.72	0.56	0.61
25	0.76	0.72	0.56	0.62
26	0.76	0.72	0.57	0.62
27	0.76	0.71	0.45	0.62
General	**0.80**	**0.75**	**0.62**	**0.59**

Ítem	Alfa de Cronbach si se elimina el elemento	Lambda 6 Guttmans G6	Average_r	Mediana de la correlación
28	0.69	0.64	0.52	0.60
29	0.68	0.64	0.54	0.61
30	0.65	0.65	0.56	0.64
31	0.69	0.65	0.50	0.60
32	0.69	0.65	0.50	0.69
33	0.65	0.66	0.51	0.55
34	0.64	0.64	0.52	0.55
35	0.65	0.62	0.45	0.57
36	0.60	0.62	0.45	0.60
General	**0.70**	**0.69**	**0.52**	**0.49**

Consolidating the reliability values through Cronbach's Alpha coefficient for each of the variables that make up the instrument (Table 4), we obtained an overall reliability of 0.77 (minimum acceptable

Alpha value = >0.70), which shows that the instrument under study meets the requirements to be acceptable.

Table 4. General reliability of variables

Variables	**Alfa de Cronbach**	**Número de Ítems**
Conocimientos	0,82	13 ítems
Actitudes	0,80	14 ítems
Prácticas	0,70	9 ítems
General	**0,77**	**36 tems**

4. Discussion

With regard to the Knowledge variable, Items 1 and 2 are supported by the conceptualization of PAIR, understood as sensorineural hearing loss (PA) caused by exposure to high noise levels >85 dB (Pollarolo et al., 2022), continuous or intermittent, prolonged, and cumulative (Chen et al..., 2020), bilateral, temporal onset, and occupational in origin (Basu et al., 2022) (Themann & Masterson, 2019), reaffirming the knowledge of AP due to occupational noise exposure (Schettini & Gonçalves, 2017), as stated by Kanji et al. (2019) (Kanji et al., 2019). In terms of PAIR occurrence (Items 3 and 4), Melese et al. (2022) mentioned factors such as the duration of exposure and the intensity of the noise level to which the worker is exposed (Melese et al., 2022), which are related to what is contained in the questionnaire used by Sayapathi et al. (2014). Regarding signs and symptoms, item 6 about "ringing in the ear as a symptom of PAIR" was integrated, which was reaffirmed by Schettini and Gonçalves (2017) and Nyarubeli et al. (2019). In the prevention dimension, five items (9-13) were constructed to inquire about the knowledge of workers about hearing protectors as a preventive measure, the responsibility for the provision and use of the same, and the periodic evaluation of hearing and protection laws for noise. These items are supported by authors such as Gómez (2016) and Mapuranga et al. (2020).

Regarding the variable attitudes, the worker's feeling of discomfort with noise and possible habituation to continuous exposure to it (items 14 and 15) are addressed, comparable to attitudes towards occupational noise explored by Hon et al. (2020), and attitudes towards the occurrence of PAIR are also explored regardless of the preventive measures applied (Ismail et al., 2013), as confirmed by a study conducted by Vásquez et al. (2017). Regarding prevention, items referring to the importance of preventive measures for the worker and the use of hearing protectors were integrated (items 20-23); in the face of exposure to noise levels harmful to hearing (Tantranont & Codchanak, 2017) (Gong et al., 2021). Attitudes related to periodicity in audiological evaluation (Sayapathi et al., 2014), worker training/education about noise and prevention of PAIR (Gómez, 2016), reporting to the employer about noisy machinery, and knowledge of Occupational Safety and Health regulations (Ismail et al., 2013) were also investigated.

With reference to practices, items related to the use of hearing protectors, periodic hearing evaluation, reporting to the employer, training and education, implementation of other preventive measures, and non-occupational noise avoidance were included (Kanji et al., 2019).

Regarding the periodic evaluation of hearing, questionnaires from various authors inquired about the performance of periodic audiometric examinations, highlighting the results of the study by Nyarubeli et al. (2019), which stated that 91% of the workers surveyed reported not having had annual audiometries performed by the company. In the same sense, attendance in training on topics of interest in Occupational Safety and Health is included (Ismail et al., 2013).

Content validation of the instrument was carried out through evaluation by expert judgment, according to Lawshe's model, 1975 modified by Tristán, 2008 (Tristán-López, n.d.), which was considered by

García (2017) as a priority indicator to calculate the content validity index, requiring statistical and methodological rigor so that the evaluated instrument can be used (García Perales, 2018). Experts are people whose specialization, professional, academic, or research experience related to the research topic allows them to assess, in content and form, each of the items included in the tool (Soriano, 2014). Thus, this method has been widely used in various studies (García et al., 2020) (Medina, 2020) (Carreño-Moreno et al., 2022) (Álvarez et al., 2016) (Jodeck-Osses et al., 2021), which seeks to establish the ability of an instrument to contain items that evoke "what they claim to be measuring and to build a representative sample of the measurement universe."

Finally, Cronbach's alpha was used to evaluate the level of reliability of the instrument by verifying the characteristics contained in the items of each dimension and variable, with the objective of identifying whether, even with the elimination of items and purification of the instrument, internal consistency continued to be favorable (Velásquez Díaz & Pineda Rodríguez, 2016). For its interpretation, some authors state that if the instrument is used for the purpose of extracting information for research, where decisions about the results do not affect the life of the person, then an acceptable level would be at a point above 0.70; if less than this level is obtained, the revision and even the redesign of the instrument should be considered (Espinosa Díaz & Llorens Baez, 2015). Considering the reliability results for each of the instrument variables, a consistency or reliability of 0.82 was obtained with a confidence interval of 95%, CI (0.81, 0.82) for knowledge, 0.80, CI (0.79, 0.81) for attitudes and 0.70, CI (0.68, 0. 71) for the practice variable, which is in an acceptable standard for the consistency of this type of test and is related to the values obtained in CAP questionnaires from authors such as Basheer et al. (2019) in India (gold standard), which obtained values of 0.60-0.7-0.85 (Basheer et al., 2019); Rus (2008) in Malaysia, who reported Cronbach's alpha scores for knowledge, attitude, and practice of 0.67, 0.92, and 0.75, respectively (Rus et al., 2008) and Sayapathi., et al. (2014).

The above-described reaffirms the reliability of the instrument in each of its variables, showing an acceptable internal consistency comparable with the referenced tests and specifically with the Gold Standard test.

5. Conclusions

In summary, the 36 items resulting from the instrument had a rich theoretical construct as a starting point that corroborated the information contained in the international KAP questionnaires and from various productive sectors that were taken as a reference for the research. The results of content validity indicated an overall CVI of 0.90, well above the minimum value required to consider the instrument acceptable, showing a high level of agreement among the judges, both for each item and for the test in general. This leads to the conclusion that it is an instrument that accurately measures proposed variables and dimensions. In relation to the internal consistency of the items associated with the study variables, Cronbach's alpha coefficient analysis was used to establish statistical reliability, obtaining an overall value of 0.77, which is considered acceptable, highlighting the favorability of these data for the fulfillment of the research objectives and scope.

Referencias

1. Álvarez, B., Patricia, E., & Rivera, D. (2016). *Validez de contenido de un instrumento para medir la responsabilidad social de las empresas bancarias*.
2. Anacona, Lilian; González, Nancy y Vela, P. (2016). *Caracterización del estado auditivo y condición de exposición a ruido de 15 DISC.JOCKEY de la Ciudad de Popayán – Cauca.* [Corporación Universitaria Iberoamericana]. https://repositorio.ibero.edu.co/bitstream/001/382/1/Caracterización del estado auditivo y condición de exposición a ruido de 15 disc.jockey de la ciudad de Popayán – Cauca.pdf
3. Basheer, R., Bhargavi, P. G., & Prakash, H. P. (2019). Knowledge, attitude, and practice of

printing press workers towards noise-induced hearing loss. *Noise and Health*, *21*(99), 62–68. https://doi.org/10.4103/nah.NAH_9_19
4. Basu, S., Aggarwal, A., Dushyant, K., & Garg, S. (2022). Occupational noise induced hearing loss in India: A systematic review and meta-analysis. In *Indian Journal of Community Medicine* (Vol. 47, Issue 2, pp. 166–171). https://doi.org/10.4103/ijcm.ijcm_1267_21
5. Carreño-Moreno, S., Chaparro-Díaz, L., & Esther Cáliz Romero, N. (2022). *Validez de la escala de soledad UCLA en cuidadores de pacientes crónicos en Colombia**. https://doi.org/10.11144/Javeriana.ie24.vesu
6. Chen, K. H., Su, S. Bin, & Chen, K. T. (2020). An overview of occupational noise-induced hearing loss among workers: epidemiology, pathogenesis, and preventive measures. *Environmental Health and Preventive Medicine*, *25*(1). https://doi.org/10.1186/S12199-020-00906-0
7. Espinosa Díaz, Y., & Llorens Baez, L. (2015). Exploración de la capacidad de liderazgo para la incorporación de TICC en educación: validación de un instrumento. *RELATEC: Revista Latinoamericana de Tecnología Educativa*, *14*(3), 35–47. https://doi.org/10.17398/1695-288X.14.3.35
8. Filza Ismail, A., Daud, A., Ismail, Z., & Abdullah, B. (2013). Noise-Induced Hearing Loss Among Quarry Workers in a North-Eastern State of Malaysia: A Study on Knowledge, Attitude and Practice. *Oman Medical Journal*, *28*(5), 331. https://doi.org/10.5001/OMJ.2013.96
9. García, J. R. A., Díez, B. F., & García, C. S. E. (2020). Construction and validation of an instrument for measuring attitudes towards Body Expression. *Retos*, *83*, 443–451.
10. García Perales, R. (2018). *Diseño y construcción de un instrumento de evaluación de la competencia matemática: aplicabilidad práctica de un juicio de expertos*. https://www.scielo.br/j/ensaio/a/FCRnhPmsd4CwF8tcnvVD64q/?format=pdf&lang=es
11. Gómez, P. (2016). *Desarrollo de una Propuesta de Intervención Educativa para modificar los Conocimientos , Actitudes y Prácticas sobre el uso de Equipo de Protección Auditiva en una Empresa Textil Patricia María Gómez Cortez Mtra . Luz Angélica de la Sierra de la Vega Dr .*
12. Gong, W., Zhao, L., Li, L., Morata, T. C., Qiu, W., Feng, H. A., & Zhu, B. (2021). Evaluating the effectiveness of earplugs in preventing noise-induced hearing loss in an auto parts factory in china. *International Journal of Environmental Research and Public Health*, *18*(13). https://doi.org/10.3390/ijerph18137190
13. Hernández Sampieri, R., Fernández Collado, C., & Baptista Lucio, M. del P. (2014). *Metodología de la Investigación* (6th ed.). McGRAW-HILL / INTERAMERICANA EDITORES, S.A. DE C.V.
14. Hon, C. Y., Tchernikov, I., Fairclough, C., & Behar, A. (2020). Case study in a working environment highlighting the divergence between noise intensity and workers' perception towards noise. *International Journal of Environmental Research and Public Health*, *17*(17), 1–11. https://doi.org/10.3390/ijerph17176122
15. Jodeck-Osses, M., Tapia-Salinas, D., & Puente, A. (2021). Construction and validation of a Reading Motivation Scale for Language and Communication Teachers (RMSLCT). *Ocnos*, *20*(3). https://doi.org/10.18239/OCNOS_2021.20.3.2525
16. Kanji, A., Khoza-Shangase, K., & Ntlhakana, L. (2019). Noise-induced hearing loss: what South African mineworkers know. *International Journal of Occupational Safety and Ergonomics*, *25*(2), 305–310. https://doi.org/10.1080/10803548.2017.1412122
17. Lie, A., Skogstad, M., Johannessen, H. A., Tynes, T., Mehlum, I. S., Nordby, K. C., Engdahl, B., & Tambs, K. (2016). Occupational noise exposure and hearing: a systematic review. *International Archives of Occupational and Environmental Health*, *89*(3), 351. https://doi.org/10.1007/S00420-015-1083-5
18. Mangelsdorff G., G., Deichler V., F., García-Huidobro D., M. A., Enríquez Ch., E., Israel V., G., & Pesqueira B., M. T. (2013). Validación de un instrumento para evaluar calidad de vida asociada a hipertrofia mamaria en mujeres chilenas. *Revista Medica de Chile*, *141*(9), 1143–1149. https://doi.org/10.4067/S0034-98872013000900006

19. Mapuranga, M., Maziriri, E. T., Letshaba, R. K., & Chitamba, A. (2020). Does occupational noise matter amongst manufacturing (Small and medium enterprises) workers? empirical evidence from Magaba, Mbare, Zimbabwe. *South African Journal of Communication Disorders*, *67*(2). https://doi.org/10.4102/sajcd.v67i2.680
20. Medina, R. (2020). Content Validity of a Measurement Instrument of Human Rights in Mexico. *Ciencias Sociales*, *168*(Ii), 203–232.
21. Melese, M., Adugna, D. G., Mulat, B., & Adera, A. (2022). Hearing loss and its associated factors among metal workshop workers at Gondar city, Northwest Ethiopia. *Frontiers in Public Health*, *10*. https://doi.org/10.3389/fpubh.2022.919239
22. Ministerio de la Protección Social. (2007). *Guía de Atención Integral en Salud Ocupacional Basada en la Evidencia para Hipoacusia Neurosensorial Inducida por Ruido en el Trabajo*.
23. Nyarubeli, I. P., Tungu, A. M., Bråtveit, M., & Moen, B. E. (2019). *Archives of Environmental & Occupational Health Occupational noise exposure and hearing loss: A study of knowledge, attitude and practice among Tanzanian iron and steel workers Occupational noise exposure and hearing loss: A study of knowledge, attitude and practice among Tanzanian iron and steel workers*. https://doi.org/10.1080/19338244.2019.1607816
24. Pollarolo, M., Immordino, A., Immordino, P., Sireci, F., Lorusso, F., & Dispenza, F. (2022). Noise-Induced Hearing Loss in Police Officers: Systematic Review. *Iranian Journal of Otorhinolaryngology*, *34*(5), 211–218. https://doi.org/10.22038/IJORL.2022.64036.3198
25. Rus, R. M., Daud, A., Musa, K. I., & Naing, L. (2008). Knowledge, attitude and practice of sawmill workers towards noise-induced hearing loss in Kota Bharu, Kelantan. *Malaysian Journal of Medical Sciences*, *15*(4), 28–34. /pmc/articles/PMC3341918/
26. Sayapathi, B. S., Su, A. T., & Koh, D. (2014). KNOWLEDGE, ATTITUDES AND PRACTICE IN RELATION TO NOISE- INDUCED HEARING LOSS IN TWO FACTORIES. *International Conference on Innovative Trends in Multidisciplinary Academic Research*, *2004*, 562–576.
27. Schettini, S. R. L., & Gonçalves, C. G. de O. (2017). Quality of life, perception and knowledge of dentists on noise. *Revista CEFAC*, *19*(6), 782–791. https://doi.org/10.1590/1982-021620171966717
28. Soriano, A. M. (2014). Diseño y validación de instrumentos de medición. Design and validation of measurement instruments. *Diá-Logos 14*, *8*(13), 19–40. http://www.redicces.org.sv/jspui/bitstream/10972/2105/1/2 disenoyvalidacion_dialogos14.pdf
29. Tantranont, K., & Codchanak, N. (2017). Predictors of Hearing Protection Use among Industrial Workers. *Workplace Health and Safety*, *65*(8), 365–371. https://doi.org/10.1177/2165079917693019
30. Themann, C. L., & Masterson, E. A. (2019). Occupational noise exposure: A review of its effects, epidemiology, and impact with recommendations for reducing its burden. *The Journal of the Acoustical Society of America*, *146*(5), 3879. https://doi.org/10.1121/1.5134465
31. Thepaksorn, P., Siriwong, W., Neitzel, R. L., Somrongthong, R., & Techasrivichien, T. (2018). Relationship Between Noise-Related Risk Perception, Knowledge, and the Use of Hearing Protection Devices Among Para Rubber Wood Sawmill Workers. *Safety and Health at Work*, *9*(1), 25–29. https://doi.org/10.1016/J.SHAW.2017.06.002
32. Tristán-López, A. (n.d.). *MODIFICACIÓN AL MODELO DE LAWSHE PARA EL DICTAMEN CUANTITATIVO DE LA VALIDEZ DE CONTENIDO DE UN INSTRUMENTO OBJETIVO*. *6*, 37–48.
33. Vásquez, G., Campos, Y., Gómez, A., & Vásquez, L. (2017). Percepción de la pérdida auditiva en trabajadores del sector de la construcción, ciudad Quito. *INNOVA Research Journal*, *2*(11), 24–30.
34. Velásquez Díaz, J. C., & Pineda Rodríguez, L. D. (2016). Diseño de un instrumento para la identificación del matoneo. *Informes Psicológicos*, *16*(2), 121–141. https://doi.org/10.18566/infpsicv16n2a08