RESEARCH

CONSTRUCTION AND EVIDENCE OF VALIDITY OF THE KNOWLEDGE ASSESSMENT INSTRUMENT ON QUATERNARY PREVENTION

CONSTRUÇÃO E EVIDÊNCIA DE VALIDADE DO INSTRUMENTO DE AVALIAÇÃO DO CONHECIMENTO SOBRE PREVENÇÃO QUATERNÁRIA

CONSTRUCCIÓN Y PRUEBAS DE VALIDEZ DEL INSTRUMENTO DE EVALUACIÓN DE LOS CONOCIMIENTOS SOBRE PREVENCIÓN CUATERNARIA

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ABSTRACT

Objective: to develop and estimate the evidence of validity of an instrument to assess the perception of medical students about Quaternary Prevention. **Method:** this is a methodological study carried out in three steps: 1) construction of the instrument to assess knowledge about Quaternary Prevention based on theoretical references; 2) content-based evidence of validity, performed by 13 judges; 3) internal structure-based evidence of validity, performed by 180 medical students. Factor analyzes were performed to verify the hierarchical structure of the model based on the two dimensions initially constructed: Knowledge Domain and Practical Domain. **Results:** the total scale content validity evidence coefficient (CVCt) was 0.98, demonstrating a high inter-rater agreement with the underlying theoretical conceptualization. As for instrument precision, all items had Cronbach's Alpha values above 0.7, indicating good precision. Good precision indicators were found for the scale with two factors (Knowledge Domain and Practical Domain) $\lambda^2 = 109,746$, gl= 103; p<0.001; $\lambda^2/gl=0.30$; CFI=0.98 and RMSEA 0.019. **Conclusion:** the IP4-15 instrument presented adequate evidence of content validity, internal structure, precision, and properties of the items to assess the knowledge and practice of Quaternary Prevention of medical students. Future studies will be needed to investigate the applicability of IP4-15 to other populations.

Keywords: Iatrogenic Disease; Quaternary Prevention; Health Promotion.

RESUMO

Objetivo: desenvolver e estimar a evidência de validade de um instrumento para avaliar a percepção dos acadêmicos de Medicina sobre a Prevenção Quaternária. **Método:** trata-se de um estudo metodológico desenvolvido em três etapas: 1) construção do instrumento para avaliação do conhecimento sobre Prevenção Quaternária a partir de referenciais teóricos; 2) evidência de validade baseada no conteúdo, realizada por 13 juízes; 3) evidência de validade baseada na estrutura interna, realizada por 180 acadêmicos de Medicina. Análises fatoriais foram realizadas para verificar a estrutura hierárquica do modelo a partir das duas dimensões inicialmente construídas: Domínio Conhecimento e Domínio Prático. **Resultados:** o coeficiente de evidência de validade de conteúdo da escala total (CVCt) foi de 0,98, demonstrando uma alta concordância entre os avaliadores com a conceituação teórica subjacente. Quanto à precisão do instrumento, todos os itens apresentaram valores de Alfa de Cronbach acima de 0,7, indicando boa precisão. Verificaram-se bons indicadores de precisão para a escala com dois fatores (Domínio Conhecimento e Domínio Prático) $\lambda^2 = 109.746$, gl= 103; p<0,001; $\lambda^2/gl=0,30$; CFI= 0,98 e RMSEA 0,019. **Conclusão:** o instrumento IP4-15 apresentou adequadas as evidências de validade de conteúdo, estrutura interna, precisão e propriedades dos itens para avaliar o conhecimento e a prática da Prevenção Quaternária de acadêmicos do curso de Medicina. Serão necessários estudos futuros para investigar a aplicabilidade do IP4-15 para outras populações.

Palavras-chave: Doença Iatrogênica; Prevenção Quaternária; Promoção da Saúde.

RESUMEN

Objetivo: desarrollar y estimar las pruebas de validez de un instrumento para evaluar la percepción de los estudiantes de medicina sobre la Prevención Cuaternaria. **Método:** se trata de un estudio metodológico desarrollado en tres etapas: 1) construcción de un instrumento para evaluar el conocimiento sobre Prevención Cuaternaria basado en referencias teóricas; 2) prueba de validez basada en el contenido, realizada por 13 jueces; 3) prueba de validez basada en la estructura interna, realizada por 180 estudiantes de Medicina. Se realizaron análisis factoriales para verificar la estructura jerárquica del modelo a partir de las dos dimensiones

construidas inicialmente: Dominio del conocimiento y dominio práctico. **Resultados:** *el coeficiente de evidencia de validez de contenido de la escala total (CVCt) fue de 0,98, lo que demuestra un alto acuerdo entre los calificadores con la conceptualización teórica subyacente. En cuanto a la precisión del instrumento, todos los ítems mostraron valores alfa de Cronbach superiores a 0,7, lo que indica una buena precisión. Se verificaron buenos indicadores de precisión para la escala con dos factores (Dominio del conocimiento y dominio práctico) λ²= 109,746, gl= 103; p<0,001; λ²/gl= 0,30; CFI= 0,98 y RMSEA 0,019.* **Conclusión:** *el instrumento IP4-15 presentó pruebas de validez de contenido, estructura interna, precisión y propiedades de los ítems adecuadas para evaluar los conocimientos y la práctica de la prevención cuaternaria de los estudiantes de medicina. Serán necesarios estudios futuros para investigar la aplicabilidad del IP4-15 a otras poblaciones.*

Palabras clave: Enfermedad Iatrogénica; Prevención Cuaternaria; Promoción de la Salud.

INTRODUCTION

Quaternary Prevention (P4) aims to identify patients at risk of exaggerated medical interventions with potential for iatrogenic events.[1,2] Despite suggesting a numerical sequence, P4 was not thought of as the last level of prevention, but as a way to improve and be applied in the three classic levels of prevention by proposing evidence-based medicine with relevant and safe actions.[3]

The discussion on Quaternary Prevention began in Belgium, with family physicians Marc Jamoulle and Michel Roland, in the mid-twentieth century. They proposed P4 in order to broaden the view of healthcare professionals and patients in relation to the possible harm suffered by unnecessary medical interventions. An example of these interventions is overdiagnosis - diagnosis of a disease that will never cause symptoms or patient death[4] - called "low-value care". They consist of interventions that do not benefit the patient, but can cause iatrogenic effects, in addition to psychological and economic distress.[5] Another example related to P4, described in a study carried out in the United States between January 2012 and May 2019, showed waste between 75 .7 and 101.2 billion dollars from unnecessary or excessive treatments.[6]

In the same context, the World Health Organization (WHO) presented, in its World Health Report,[7] the 10 main causes of inefficiency in healthcare systems. Among them are the inappropriate and inefficient use of medication, overuse or oversupply of healthcare products and services (equipment, complementary forms of diagnosis and procedures), medical errors and the quality of care and use of strategies. inappropriate and ineffective health interventions. With a view to these issues, the importance of P4 for health systems and patients is understood.

Among other issues, P4 proposes medical practice with the person at the center of care, and not the disease itself.[8] This proposal corroborates the current National Curriculum Guidelines for the Medicine course, established in Brazil by the Ministry of Education in 2014, which they place the graduate as a promoter of the integral health of the human being.[9] This context is strongly identified with P4 and alerts to the importance of understanding and discussing this theme in the training of these healthcare professionals.

Given the above and the finding that there is no instrument to identify the knowledge and practice of P4, this study aimed to develop and estimate the evidence of validity of an instrument to assess the perception of medical students about Quaternary Prevention.

METHOD

This is a methodological study carried out in three steps: 1) construction of the instrument; 2) determination of content-based evidence of validity; and 3) determination of internal structure-based evidence of validity.

Construction of the instrument

This step consisted, initially, of researching the theoretical framework on quaternary prevention in databases of indexed scientific journals. The construction of the Knowledge Assessment Instrument on Quaternary Prevention (IP4-15) was structured considering two characteristics: the conceptual definition and professional practice on the subject. Thus, the instrument was composed of two dimensions: 1) Knowledge Domain; and 2) Practical Domain. For the responses, a 5-point Likert scale was used, ranging from 1 (totally disagree) to 5 (totally agree).

Content-based evidence of validity

Content analysis was performed by 13 judges, who are physicians working in different specialties and aged between 33 and 60 years. These specialists analyzed each instrument item under the following parameters: a) Appearance; b) Ease of reading and filling out; c) Clarity and understanding of the items; and d) Pertinence of content. Content validity was assessed using the content validity coefficient for each item (CVCi) and for the instrument as a whole (CVCt). CVC values above 0.8 are considered adequate.[10]

Internal structure-based evidence of validity

The sample consisted of 180 students from the six years of the Medicine course at a private higher education institution based in the city of Maringá, Paraná. Students were invited to participate in the study through an e-mail sent by the course coordination and through social media groups (Facebook® and WhatsApp®) during the months

of February and March 2019. The instrument was formatted in the Google electronic form Forms.

To verify the number of factors to be considered in the instrument, the retention methods based on the Parallel Analysis, the Minimum Rank Factor Analysis (MRFA) and the Hull Method[11] were used. The indicators of data adequacy, Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity Test were also evaluated. Then, Exploratory Factor Analysis (EFA) was used, using the estimation method of unweighted least squares (Unweighted Least Squares) and Oblimin rotation to analyze the internal structure of the Knowledge Assessment Instrument on Quaternary Prevention (IP4 - 15).

The model's fit was tested using the fit indexes (expected reference values for each index): Chi-square (λ^2 and p-value), Mean Squared Error of Approximation (RMSEA < 0.08,90% I.C.) and comparative fit index (CFI > 0.90). These indices aim to assess whether the model presents a good fit of the data, as proposed in the literature.[12,13] To assess the precision indicators of the factors that make up the instrument, we resorted to internal consistency through the analysis of the alpha coefficients of Cronbach and McDonald's Omega. For both coefficients, values equal to or greater than 0.7 indicate good accuracy,[14] but values greater than 0.6 can be considered adequate - especially when dealing with instruments under development and in their first version.[15,16] The aforementioned analyzes were carried out using the Factor v statistical software. 10.3.[17]

The last step of data analysis consisted of evaluating the properties of the items using the Item Response Theory (IRT). For this purpose, the Rating Scale Model was used with the Joint Maximum Likelihood estimation method, a model for polytomic items belonging to the Rasch family of IRT models.[18] Considering that the IP4 - 15 is structured in a measurement model composed of two factors, which were evaluated independently. Thus, different properties of the items were evaluated, such as difficulty levels, Infit/Outfit adjustment indicators, item-theta ratio, and item characteristics curve. Finally, the information curves for the respective factors were presented in order to verify the extent of the latent trait evaluated by the set of items. Analyzes were performed using the statistical software WINSTEPS v. 7.3.[19] As suggested by Bond and Fox,[18] the values of the Infit and Outfit indices can vary from 0 to infinity, with values close to 1 indicating a good fit, with values between 0.7 and 1.3 being considered adequate. Finally, the accuracy indicators estimated by the TRI model were also verified, which can be interpreted similarly to the internal consistency coefficients, omega and alpha.

Ethical aspects

Clarifications about the research and the Free and Informed Consent Form (ICF) followed the recommendations of the Resolution of the National Health Council (CNS) no. 466/2012 and appeared on the first page of the online instrument, with the option of refusal or acceptance for participation in the study. This research was approved by the Research Ethics Committee under opinion report no. 2,407,703 on 11/30/2017.

RESULTS

Construction of the instrument

From the theoretical references identified in scientific journals on Quaternary Prevention, 15 items were formatted. Ten of them made up the Knowledge Domain (1, 3, 4, 6, 8, 9, 11, 12, 13, and 15), and 5 the Practices Domain (2, 5, 7, 10, and 14). The responses initially formatted on a five-point Likert scale were changed to a three-point scale: 1) I totally disagree, 2) I neither agree nor disagree, and 3) I totally agree, as proposed in Figure 1.

Content-based evidence of validity

All items obtained high values of content validity coefficients for the analyzed parameters with values

Table 1 - Content validity coefficients of IP4-15 items

Items	Content	A	F	C	P
PQ1	The pharmaceutical industry is based on disease risk factors to introduce drugs on the market	1.00	0.97	0.97	1.00
PQ2	Complementary exams do not cause significant harm to the patient	1.00	1.00	0.92	1.00
PQ3	There are screening and treatment protocols that still lack scientific confirmation of their effectiveness in effectively reducing mortality	1.00	1.00	1.00	1.00
PQ4	There is a tendency to use drugs to control risk factors to the detriment of non-pharmacological strategies	0.97	0.97	0.97	0.97
PQ5	Risk factors should be medicated as they are causal factors of diseases	0.97	0.92	0.92	0.97

Legend: A=Appearance; F=Easy to read and complete; C=Clarity and understanding of the item; P=Pertinence of the content.

...continuation

Table 1 - Content validity coefficients of IP4-15 items

Items	Content	A	F	C	P
PQ6	Current medicine is excessively interventionist	0.97	0.97	0.97	0.97
PQ7	Regardless of the patient's opinion, the physician must select the medical procedure to be performed	0.95	1.00	0.97	1.00
PQ8	Uncertainties inherent in clinical practice must be faced gradually, avoiding unnecessary tests, except in urgent and emergency cases	0.97	0.97	0.97	0.97
PQ9	The physician has the autonomy and scientific knowledge to resist interventionist protocol behaviors	1.00	1.00	0.95	1.00
PQ10	Annual check-ups are required in asymptomatic patients	0.97	0.97	0.97	0.97
PQ11	Unnecessary tests for diagnosis are ordered too often	1.00	1.00	1.00	1.00
PQ12	The action implemented to reduce the functional impairment of one or more established diseases in an individual or population is one of the attributions of quaternary prevention	0.97	0.95	0.95	0.97
PQ13	Actions to identify patients with excess medication and tests are part of quaternary prevention	1.00	1.00	1.00	1.00
PQ14	Carrying out various medical interventions in order to obtain correct diagnoses and treatments is the practice of quaternary prevention	1.00	0.97	1.00	1.00
PQ15	Respecting the autonomy of patients and doctors and practicing medicine based on a truly therapeutic relationship is acting in accordance with quaternary prevention	1.00	1.00	1.00	1.00

Legend: A=Appearance; F=Easy to read and complete; C=Clarity and understanding of the item; P=Pertinence of the content.

above 0.92 (Table 1). The total scale content validity coefficient (CVCt) was 0.98. These results demonstrate a high rater agreement with the underlying theoretical conceptualization.

Sample characteristic

The sample consisted of 180 students from all graduation years of the institution's Medicine course, of both genders (70% female) and aged between 18 and 41 years (mean age 22.8) (Table 2).

Table 2 - Sociodemographic profile of the study participants

Variables	N (%)
Male	54 (30)
Female	126 (70)
	Years (SD)
Age, mean	22.9 (3.78)
Graduation Year	N (%)
1st year	26 (14)
2nd year	41 (23)
3rd year	36 (20)
4th year	23 (13)
5th year	38 (21)
6th year	16 (09)

Internal-struture based evidence of validity

Before performing the EFA itself, the Kaiser-Meyer--Olkin (KMO) data adequacy indicators and the Bartlett Sphericity Test (380.5) were evaluated, which indicated that the variance proportions of the items could be explained by latent variables (KMO=0.675) and demonstrate the adequacy of the correlation matrix for performing the EFA (gl=130, 380.5; p< 0.001). Thus, the methods of factor retention, Parallel Analysis (PA) MRFA and Hull were verified, and all suggested adequacy of the internal structure composed of two factors.

Since only the first two factors estimated from the actual data showed explained variance (23.39 and 18.42%) greater than the average of explained variances (14.75 and 12.20%) and the values allocated in the 95th percentile (16.43 and 14.50%) of factors estimated from simulated data, 500 correlation matrices, estimated by the permutation method. In the same direction, the Hull method indicated that the two-factor structure had the highest Scree test value (103) 5.758 and, therefore, was characterized by the most relevant structure.

In accordance with the retention methods, EFA was performed, forcing the two-factor solution. The results are presented in Table 3, in which the values of commonality of the items, factor loadings, correlation between the factors, percentages of explained variance and indicators of internal consistency of the factors are verified.

As observed in Table 3, the structure composed of two factors does not present cross factor loadings, that is, factor loadings greater than 0.3 in more than one factor. As for the items of the first factor (N=10), the factor loadings varied between 0.352 (item 12) and 0.456 (item 3), while for the second factor (N=5) it varied between 0.307 (item 7) and 0.515 (item 14). As for the theoretical

Table 3 - Internal structure of IP4-15

Dimension	Item	h²	Factorial Matrix of 2 Factors	
			PC	PP
Knowledge Domain	1	0.229	0.359	
	3	0.428	0.456	
	4	0.385	0.441	
	6	0.699	0.535	
	8	0.331	0.366	
	9	0.369	0.416	
	11	0.586	0.449	
	12	0.418	0.352	
	13	0.673	0.417	
	15	0.611	0.438	
Practice Domain	2	0.475		0.384
	5	0.721		0.511
	7	0.588		0.307
	10	0.437		0.512
	14	0.494		0.515
Correlation between factor			-0.195	
Alfa			0.71	0.64
Omega			0.71	0.64

Legend: h^2 = commonality; PC = Domain Knowledge; PP = Practical Domain.

interpretation of the sets of factors, it is observed that factor 1 (one) grouped items whose contents covered the level of knowledge and agreement with expressions of contents and definitions related to Quaternary Prevention, being called attitude focused on knowledge.

The second factor grouped items whose contents covered the level of knowledge and agreement with expressions aimed at the practice of P4; therefore, it was named as practice-oriented posture. Still regarding the factorial structure, a negative association of low magnitude was observed between the factors.

It is noteworthy that the structure composed of two factors explained 41.81% of the total explained variance of the data, with 23.39% corresponding to the first factor and 18.42% corresponding to the second. Furthermore, it presented adjustment indices considered good: λ^2= 109,746, gl= 103; p<0.001; λ^2/gl=0.30; CFI= 0.98 and RMSEA 0.019, which reinforces the adequacy of the internal structure obtained. Finally, there were good precision indicators for the attitude factor focused on knowledge and values considered adequate for the posture factor focused on practice.

Rating scale model

Once the first evidence of validity and accuracy of the PI4-15 was estimated, we decided to evaluate the properties of the items using the Rating Scale Model. The results are presented in Table 4, where the item difficulty indices, fit indices and item-theta correlation are verified.

As shown in Table 4, with regard to the first factor: knowledge-oriented attitude, the items varied in terms of difficulty between -0.58 (item 11: Unnecessary diagnostic tests are requested very often), and 1, 13 (item 9: The doctor has the autonomy and scientific knowledge to resist interventionist protocol conducts). Suggesting the ability of the items that make up the factor to assess 1.7 logits of the respondents' skill level, it is noteworthy that the participants' theta level varied between -0.61 and 2.78, with a mean value equal to 0.73.

Such results suggest a shortcoming of the instrument in having items with more adequate levels for the assessment of the highest levels in the theta scale, between 1.13 and 2.78, with a mean equal to -0.59. Regarding the adjustment indices, adequacy of all items that made up the factor is observed, since they are in the range suggested in the literature between 0.7 and 1.3. Additionally, moderate correlations are observed between the items and the theta level of the participants, suggesting the ability of the items to estimate people's ability level.

The last step of item analysis consisted of examining the response category curves for the items. The graphical results presented in Figure 1 provide information on the pattern of use of points on the response scale of the items by factor. Thus, the curves referring to the five points of the Likert scale and the probabilities of endorsing these curves are observed as a function of the theta level of the respondents. According to the method used, each response category must represent a distinct extension of the latent trait and must increase monotonically.

The initial analysis of the response category curves referring to Factor 1 indicate an overlap of the categories referring to points 2, 3 and 4 of the Likert scale, making it impossible to specifically represent the latent trait referring to each of these response possibilities. Thus, it was decided to group them by adapting the three-point response scale. The results are shown in Figure 1 (upper right quadrant). Equivalent decisions were made in relation to the response scales referring to the Factor 2 items. The results are shown in Figure 1 consistent with the lower quadrants.

Still regarding the potentiality of the set of items that make up each factor to adequately assess different levels

Table 4 - Item properties via

Item	b	Infit	Outfit	r		Item	b	Infit	Outfit	r
1	0.49	0.99	1.01	0.33		2	-0.16	0.95	0.98	0.52
3	-0.52	0.90	0.92	0.41		5	-0.06	0.87	0.86	0.56
4	-0.33	1.08	1.18	0.45		7	1.14	1.21	1.05	0.40
6	0.31	0.85	0.85	0.49		10	-0.97	1.04	1.02	0.67
8	0.13	1.17	1.15	0.45		14	0.05	1.06	1.04	0.57
9	1.13	0.86	0.84	0.47						
11	-0.58	1.11	1.02	0.43						
12	0.15	1.13	1.12	0.47						
13	-0.27	1.10	1.07	0.45						
15	-0.52	1.03	1.02	0.39						
Mean	0.00	1.02	1.02				0.00	1.02	0.99	
SD	0.52	0.11	0.11				0.67	0.11	0.07	

Legend: b=item difficulty index; Infit and Outfit=item fit indices; r=item-theta correlation - "latent trait estimated by the model".

Factor 1

Factor 2

Figure 1 - Characteristic response curves for factors 1 and 2.
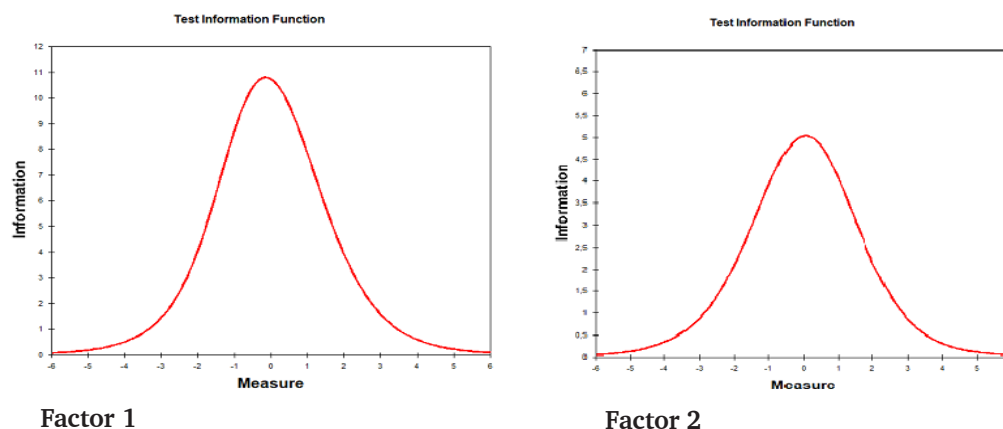
Factor 1

Factor 2

Figure 2 - Test Information Function for factors 1 e 2.

of the latent variable, the test information curves were estimated. The results are shown in Figure 2.

The results suggest greater accuracy of items for estimating theta level close to the mean. Thus, for both factors, greater precision is observed for estimating the theta range between -2 and 2. This suggests the instrument's potential to accurately assess participants with different levels of latent variables. Finally, the precision index estimated by the model indicated a coefficient equal to 0.64 for factor 1 and 0.59 for factor 2.

DISCUSSION

The IP4-15 instrument was developed with the purpose of evaluating the knowledge and practice of Quaternary Prevention, in addition to being a tool to raise awareness and spread the discussion on quaternary prevention, in order to protect patients from exaggerated and unnecessary[3] and encourage medical practice free of conflicts of interest.

The first step of construction of the IP4-15 for the development of the structuring of the instrument included the analysis of theoretical references in search of concepts and applications consistent with the reality of current health for the formulation of the items,[20] which totaled 15 statements on the subject. In the next step, referring to the evaluation of the evaluators, considered extremely important for the reliability of the questionnaire,[21] a CVCi greater than 0.80 was obtained, a value considered by Pasquali[15] as the minimum necessary to obtain evidence of validity based on the content of each item. Then, the instrument was improved by adopting the evaluators' suggestions and, after being restructured, it was applied to the selected population.

The internal structure indicated by the factor retention and EFA methods grouped the items into two factors

consistent with the theoretical proposal that supported the construction of the instrument. The first factor comprised the assessment of the students' level of understanding of P4; therefore, it was named posture focused on the knowledge of P4. The theoretical scope of that factor corroborates the notes by Hespanhol[22] regarding the increase in diagnostic and therapeutic interventions in the health area, which are becoming increasingly invasive and sophisticated and decreasing the safety interval between benefits and risks regarding the need to scientific support for population screening programs, with controlled and randomized trials of correlation and observational studies to demonstrate their evidence, a practice not carried out for many of them.

In this direction, Norman and Tesser[8] warn about the potential harm of medical intervention, since care, whether curative or preventive, can be a risk factor for health when excessive. The authors also point out that P4 obliges health professionals to resist consensus, protocols, professional-technological-pharmaceutical corporations and public opinion by refusing to adopt interventions when unnecessary. Thus, it is understood that high scores in the Knowledge factor indicate knowledge about P4 and a critical attitude of the professional in relation to excessive interventions and screening and treatment protocols.

The second factor grouped items whose contents were associated with knowledge and the use of traditional practices, focused on medicalization, interventions, and complementary tests, being called posture focused on the practice of P4. The need to evaluate this phenomenon stems from the increase in diagnostic and therapeutic interventions in the health area, which are becoming increasingly invasive and sophisticated and decreasing the safety interval between benefits and risks.

Norman and Tesser[8] show the possible harm caused by complementary tests - false positives, borderline situations and deviations from clinical reasoning - which are often requested unnecessarily due to pressure from patients or because of the doctor's protection. In addition, the authors point out that the thought that risk factors are causal factors of diseases and, therefore, should be medicated. It is erroneous, when they explain that the risk factor is simply a statistical association with the disease, not being necessary or sufficient for it to occur, and whose avoidance reduces its frequency, but does not eliminate it. Respondents with high scores on this factor have a professional background more focused on the excessive use of complementary exams, as well as a more drug-based and interventionist attitude.

In addition to the theoretical adequacy of the factors, good precision indicators were observed for the instrument, which suggests adequacy of the set of items and estimates the characteristics of participants with a low level of error associated with the measurement, with indexes greater than 0.70. In this sense, the proportion of measurement errors is understood as those that cannot be controlled by the researcher, that is, they are random and, consequently, unpredictable. On the other hand, they are strongly distinguished from systematized errors, those that can be predicted, such as testing conditions and environment, application procedures, correction and analysis of instruments, among others. Thus, information about the measurement error was essential for the purpose of evaluating and using psychometric instruments.[23,24]

After assessing the internal structure and estimating the accuracy of the IP4-15, the Item Response Theory (IRT) was used to assess the properties of the items, a procedure that enabled a greater understanding of the IP4-15 characteristics. The first is presented by the Infit/Outfit adjustment indices, which indicate the suitability of the items for estimating the characteristics of respondents allocated to different theta levels.

It is noteworthy that the Infit indices of the items, all within the appropriate range, indicated the response pattern expected by the model, demonstrating the ability to be predicted by the model when the item intensity values (difficulty) are close to the skill values (theta) of the respondent. In turn, the Outfit indices, also all within the expected range, indicated the adequacy of responses to the items when the difference between the respondent's theta and the item's intensity is very large. In these cases, a person with a high level of adaptive efficacy could endorse categories of answers corresponding to the poorly

adequate level of adaptation and vice versa, in items with these characteristics.[19]

In addition, the item difficulty indices enabled a better understanding of the continuum evaluated in each of the dimensions that made up the IP4-15. In the posture dimension, focused on knowledge, it is observed that the items that are easier to be endorsed by professionals were those related to complementary tests, such as item 11 (Unnecessary tests for the diagnosis are requested very frequently) and item 3 (There are screening and treatment protocols that still lack scientific confirmation of their effectiveness in effectively reducing mortality).

On the other hand, the most difficult items to endorse were those related to the intervention nature of Medicine, such as items 9 (The doctor has the autonomy and scientific knowledge to resist interventionist protocol conducts), item 1 (The pharmaceutical industry based on disease risk factors to introduce drugs on the market') and 6 (Current medicine is excessively interventionist). Such results are important when considering that, although the professional may agree with actions proposed by P4, he may find resistance in pointing out that current medicine can be invasive.

In the same way, in the practice-oriented posture dimension, the items that were easier to be endorsed by the respondents were associated with carrying out additional tests, as in item 2 (Additional tests do not cause significant harm to the patient) and item 10 (Exams for annual "checkups" are required in asymptomatic patients). Item 7 (Regardless of the patient's opinion, the physician must select the medical procedure to be performed) was configured as the most difficult item to be endorsed. Suggesting the difficulty faced by doctors in realizing that medicine should not be interventionist and that care should be thought of jointly with the patient.

Examination of the characteristic response curves of the items indicates the overlapping of alternatives 2, 3 and 4 (1 - totally disagree, 2 - disagree, 3 - neither agree nor disagree, 4 - agree and 5 - totally agree), resulting in a response key of the Likert scale composed of three points, since it was intended to analyze the perception of health professionals when verifying the level of agreement with each item. Such results are consistent with the contents of the items that seek to access the professionals' agreements with professional practices and expressions of technical knowledge. Content that seems more difficult to grade on a five-point scale. Thus, a three-point scale was used (see the adequacy of this proposal in Figure 1): 1 - I totally disagree, 2 - I neither agree nor disagree and 3 - I totally agree.

Finally, precision indicators were observed for the factors, estimated by the Rasch model, which were slightly lower than those estimated by the alpha and omega coefficients, which is justified by the way these methods are estimated, while the traditional coefficients assume error variance equal to 0 for extreme values, the Rasch model treats these data as missing data. Therefore, the precision measure from the Rasch model is more conservative in this aspect and tends to present smaller coefficients when compared to alpha and omega precision.

In general, the methodological strategy of employing classic and modern psychometric models in a complementary way for the evaluation of PI4-15 is understood as adequate. This is because the factorial analysis and the analysis of internal consistency made it possible to deepen the knowledge of the measurement model in a more global perspective, such as its factorial configuration, set of items that make up the respective factors and level of consistency of the set of items. The IRT, on the other hand, provided greater knowledge about the level of difficulty of the items, characteristics of the respondents (level in the latent trait), as well as the association between properties of the items and characteristics of the respondent (test information curve).[24]

Some of the limitations of this research are highlighted, such as the composition of a non-random convenience sample and regional representativeness, with the majority of participants coming from the southern region of the country. In addition, further research is suggested to estimate other evidence of validity of the IP4-15 instrument, such as those based on the relationship with external variables and standardization, as well as its application to professionals trained in the field of health sciences.

Future investments based on TRI can be made for the development of an abbreviated version of the instrument. In this sense, a balance in the number of items between the factors must be sought without losing the potential of the instruments to assess the extension in the theta scale, that is, to value the exclusion of items that overlap in the level of difficulty. Since it is an instrument that aims to investigate how physicians and medical students understand and act in relation to quaternary prevention, a smaller instrument can help more effectively to understand these variables and, thus, allow a more assertive intervention.

CONCLUSION

It is concluded that the IP4-15 instrument presents evidence of content validity, internal structure, accuracy, and properties of the items adequate to assess the knowledge and practice of quaternary prevention (P4) of medical students. Future studies will be needed to investigate the applicability of IP4-15 in other populations.

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