

VALIDATION OF AN INSTRUMENT TO ASSESS FACTORS ASSOCIATED WITH ADHERENCE TO STANDARD PRECAUTIONS AMONG DENTISTS IN PRIMARY HEALTHCARE

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ABSTRACT

Accidents with biological material are a reality in dental practice. The use of preventive measures such as the adoption of Standard Precautions (SP) is essential, thus this study aims to validate an instrument to check factors associated with adherence to SP among dentists. The scales of psychosocial and organizational factors that influence adherence to SP were the starting point. These scales have already been nationally validated for doctors and nurses. The instrument consisted of 49 items divided into five dimensions. The process of instrument validation involved the following steps: its adaptation for situations that pose risks to dentists; content and semantic analysis by a committee of judges, and application to dentists. The

adapted instrument was applied to 224 dentists who provided primary healthcare in the north region of Paraná State. After the application of scales, the psychometric properties were analyzed using the factor analysis technique and a reliability test. The factor analysis confirmed three domains: Obstacles to following standard precautions; Knowledge of occupational transmission of HIV and Safety climate. The reliability of the domains was considered adequate (Cronbach's alpha between 0.73 and 0.88.). The instrument demonstrated adequate psychometric properties to assess factors that influence adherence to SP among dentists.

Keywords: Validity; Reliability; Universal Precautions; Dentists

VALIDAÇÃO DE UM INSTRUMENTO PARA AVALIAR OS FATORES ASSOCIADOS A ADEÇÃO ÀS PRECAUÇÕES PADRÃO ENTRE CIRURGIÕES-DENTISTAS DA ATENÇÃO BÁSICA

RESUMO

Os acidentes com presença de material biológico são uma realidade na prática odontológica. A utilização de medidas preventivas como a adoção das Precauções Padrão (PP) é essencial, desta maneira este estudo tem como objetivo validar um instrumento para verificação de fatores associados à adesão às PP, entre dentistas. Partiram-se das Escalas de Fatores Psicossociais e Organizacionais que Influenciam a Adesão às Precauções-Padrão, já validadas nacionalmente para enfermeiros e médicos. O instrumento compôs-se de 49 itens distribuídos em 5 dimensões. O processo de validação do instrumento seguiu as seguintes etapas: adaptação do instrumento para as situações que envolvem riscos aos dentistas por meio da análise semântica e análise de conteúdo, as quais foram realizadas por um comitê de juízes. O

instrumento adaptado foi para 224 dentistas que atuavam na Rede Básica de Saúde na região Norte do Estado do Paraná. Após aplicação das escalas foram analisadas as propriedades psicométricas através das técnicas de análise fatorial e teste de confiabilidade. A análise fatorial confirmou três domínios: Obstáculo para seguir às Precauções Padrão; Conhecimento da transmissão ocupacional do HIV e Clima de segurança. A confiabilidade dos domínios foi considerada adequada (alfa de Cronbach entre 0,73 e 0,88). O instrumento demonstrou propriedades psicométricas adequadas para avaliar fatores de influência na adesão as PP, entre dentistas.

Palavras chave: Validade; Confiabilidade; Precauções Padrão; Dentistas.

INTRODUCTION

Properly taken preventive measures against accidents work effectively, particularly in professional environments^{1,2}. Therefore, government agencies have systematically established regulations such

as the adoption of Standard Precautions (SP) for healthcare providers^{3,4}.

Even with adherence to standard precautions and the routine use of appropriate barriers to ensure protection against most microorganisms, healthcare

providers are at risk of accidents involving potentially contaminated blood and body fluids, and of acquiring blood-borne infections^{1,3}.

The adoption of SP is considered an effective tool in the strategy for preventing contamination and transmission of infectious agents among patients and healthcare providers⁵⁻⁷. However, failures in these precautions have been found to cause high incidence rates of work accidents caused by exposure to body fluids and sharp objects⁵⁻⁸.

The adherence to safety measures by dentists has been shown to be frail, as dental practice by nature involves a wide range of potentially harmful agents such as constant aerosol formation with saliva and/or blood and handling sharp materials in a small field of view, considerably increasing the risk of accidents and contamination⁸⁻¹¹. Thus, the adoption of preventive measures is essential.

A review of the literature in search of information about non-compliance with SP by healthcare providers found that the abovementioned factors may go beyond the individual issue. Some authors report that adherence to SP may be associated with individual factors such as occupation, working hours, and level of knowledge of SP, as well as to psychosocial factors such as fear and work-related stress, and to organizational factors such as organizational security climate and participation in training¹²⁻¹⁴. In this sense, the role of dentists in primary care as members of a multidisciplinary team and the fact that they belong to an organization with distinctive work features favor the evaluation of these factors. In the United States, discussions of the 'Model of Adherence to Universal Precautions'¹³ and the 'Model of Work System'¹⁴ have extrapolated individual issues as factors responsible for the adoption of safe behavior, since organizational issues are present and have a relevant role. In the Model of Adherence to Universal Precautions, the aspects of influence are divided into individual, psychosocial and organizational factors, while in the Model of work system, adherence may be influenced by individual and organizational factors, and also by work-related factors.

A Brazilian study used the Models of Adherence to Universal Precautions and the Model of Work System as a theoretical basis and proposed the 'Explanatory Model of Adherence to Standard Precautions' by validating the scales¹² among doctors and nurses, and identified four categories of factors

that can influence adherence: knowledge of risks and preventive measures; assessment of occupational risk and the effectiveness of prevention; barriers and interference in work performance; organizational aspects such as structure and managerial support.

Thus, the aim of this study was to adapt and validate an instrument to check factors associated with adherence to SP among dentists.

MATERIAL AND METHODS

This is a methodological study that aims to adapt and analyze the structure and reliability of factors in psychometric scales that have already been translated and culturally adapted to our environment¹²: Knowledge of occupational transmission of HIV (8 items) and Risk perception (5 items), which include individual factors; Obstacles to SP (7 items), which comprises work-related factors; Safety climate (17 items), which includes organizational factors; and Adherence to SP (13 items). The scales are of the Likert type, with five response options in a progressive sequence from one to five points (1 to 5).

As the original instrument was developed to be applied to doctors and nurses, it had to be adapted to situations involving risks to dentists. This was done in the following two steps:

Step One – Instrument adaptation:

In this stage, the original instrument was presented to five dentists who worked both as teachers and in their private practices. They were asked to evaluate the items on the scale, identifying any situations/procedures that are not usual in dental practice and should be modified. Then they suggested other procedures performed by dentists, which involved the same risk as the items to be replaced. Five dentists could suggest up to three procedures.

Step Two - Content analysis

The instrument developed in Step One (Instrument Adaptation), with the items to be replaced and the three suggested options, was analyzed regarding content. Five dentists and nurses who were experts on the subject and proposed method were invited to participate by choosing the item that best represented the situation being substituted. If they considered that none of the three suggested options was right for the situation, they could suggest another. Adjustments were made and a corrected version of the instrument was prepared.

Instrument validation

The participant population consisted of all dentists (N=224) who worked in the Primary Healthcare System in six counties in the north of Paraná. The eligibility criteria were to be providing direct patient care and being active in the dental profession throughout the period of data collection. Dentists who were on vacation, on leave, or in administrative leadership positions were excluded. Data were collected from July to November 2008.

The researcher applied the instrument at pre-established times at the workplaces of the survey participants. All participants signed a Consent Form. The study was approved by the Ethics Committee of the Universidade Estadual de Londrina under No. 279/07.

The study followed national and international standards of ethics in research involving human beings. To evaluate the construct validity of the adapted version, exploratory factor analysis was performed using the method of principal components and varimax rotation among the instrument items which were grouped into five factors, with the criterion to exclude any which had factor loadings less than or equal to 0.30^{15, 16}.

The reliability analysis was verified by the means of internal consistency of scale items, measuring the coefficient of Cronbach's alpha. Alpha values between 0.70 and 0.90 were considered appropriate^{17, 18}.

RESULTS

Instrument adaptation

Semantic and content analyses were made by experts in the subject and the proposed methodology. There was 100% agreement among judges regarding the withdrawal and/or modification of suggested items.

Instrument validation

A total of 224 dentists participated in the instrument validation. There were more females (63.8%) and 75.4% were aged 30-49 years, with average age 40 years. 51.3% had 11 - 20 years' experience in the profession, and had been working at the institution for less than 10 years (50.4%), for 40 hours a week on average (Table 1). Initially, Item 12 of the dimension called 'Adherence to SP' was deleted because 100% of the participants provided the same answer to it, leaving the instrument with 48 items.

Data analysis

The factor structure of the scale was verified, in which the 48 items proposed to comprise the instru-

ment were subjected to exploratory factor analysis and distributed in five factors. The rotated component matrix showed that nine had a factor loading of less than 0.3. According to the previously established criteria, it was decided to exclude these items.

An instrument reduced to 39 new items was obtained and a new factor analysis was performed, with grouping into five factors and verification of factor loadings. Considering the results in which the method of principal components was used after varimax rotation, the internal consistency of each domain was verified in accordance with Cronbach's alpha. Factors number four and five were excluded because their alpha was considered non-significant (below 0.70). After instrument validation for application to dentists, 27 items were retained, confirming the following theoretical constructs: a) **Obstacles to SP** (Cronbach's alpha=0.760) with 4 items; b) **Knowledge of occupational transmission of HIV** (Cronbach's alpha=0.732) with 6 items; c) **Safety climate** (Cronbach's alpha=0.885) with 17 items:

Fig. 1 shows the steps followed for instrument validation and the composition of the items in each of them. After all the methodological steps were completed, the final version of the 'Scale for assessment of fac-

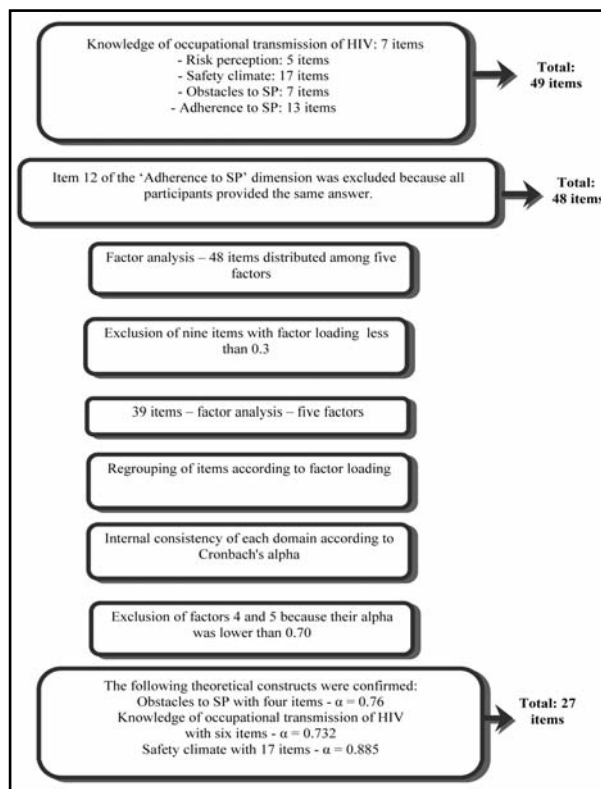


Fig. 1: Steps after the process of instrument validation.

Table 1: Sociodemographic characteristics (n=224).

VARIABLES	n	%	MINIMUM	MAXIMUM	MEAN	SD
GENDER						
Female	143	63.8				
Male	81	36.2				
ORIGIN						
Londrina	95	42.4				
Apucarana	35	15.6				
Cambé	30	13.4				
Arapongas	23	10.3				
Ibiporã	23	10.3				
Rolândia	18	8.0				
AGE (YEARS)			22	72	39.6	7.9
22 to 29	30	13.4				
30 to 39	77	34.3				
40 to 49	92	41.1				
50 to 59	23	10.3				
≥60	2	0.9				
PROFESSIONAL EXPERIENCE (YEARS)			1	44	16	7.8
1 to 5	30	13.4				
6 to 10	24	10.7				
11 to 20	115	51.4				
>20	55	24.5				
YEARS WORKED AT THE INSTITUTION			1	33	10.2	7.3
1 to 5	84	37.5				
6 to 10	29	12.9				
11 to 20	99	44.2				
>20	12	5.4				
WEEKLY WORKING HOURS			12	78	40.8	11.7
12 to 19	4	1.8				
20 to 29	28	12.5				
30 to 39	14	6.25				
≥40	178	79.5				

tors associated with adherence to standard precautions among dentists' was considered by the authors to be finalized, as shown in Table 2.

DISCUSSION

In order for an assessment tool to be used in another culture with the same psychometric properties it must undergo a rigorous, systematic process of adaptation. The cultural adaptation of an assessment tool is only considered valid if its psychometric properties are confirmed, and this is only possible after the instrument is subjected to empirical analyses in order to demonstrate its reliability and validity¹⁹.

Psychometric tests are essential components for assessing or achieving cultural equivalence of the instruments¹⁷. According to Fayers and Machin¹⁷ this phase is critical because the equivalence of a measure can only be demonstrated through analysis

of these psychometric properties and their consistency with the original questionnaire. Therefore, validity and reliability should be evaluated¹⁷.

Content validity of an instrument verifies the ability of items to represent adequately all aspects of the content to be addressed by the instrument. As it is based on a trial, a committee of judges (experts in the subject) shall consider how appropriate the items are¹⁵. In this analysis, the judges should be experts in the area of the construct, because their task is to consider/assess whether or not the items refer to the point or subject in question. An agreement of at least 80% among judges can serve as a decision criterion on the relevance of the item and the point or subject to which it theoretically relates¹⁶.

In this study there was 100% agreement among judges regarding the withdrawal or modification of suggested items.

Table 2: Scale for 'Assessment of Factors Associated to Adherence to Standard Precautions among Dentist'.

<i>Please answer the following questions about Standard Precautions (SP) at your workplace. 1.Strongly agree 2.Agree 3.Undecided 4.Disagree 5.Strongly disagree</i>						
Obstacles to SP	1. The accumulation of daily activities often interferes with my ability to follow SP.	1	2	3	4	5
	2. I cannot always follow SP because the needs of my patients come first.	1	2	3	4	5
	3. Sometimes there is not enough time to use SP.	1	2	3	4	5
	4. Following SP makes my job harder.	1	2	3	4	5
<i>HIV can be transmitted to health professionals when... 1.Strongly agree 2. Agree 3.Undecided 4.Disagree 5.Strongly disagree</i>						
Knowledge of occupational transmission of HIV	5. Dressing a wound in an HIV-infected person without wearing gloves.	1	2	3	4	5
	6. Performing anesthesia and/or puncture on an HIV-infected person without using gloves.	1	2	3	4	5
	7. Having my mouth or eyes splattered with blood or other body fluids from HIV-infected patients.	1	2	3	4	5
	8. Having contact with HIV-positive blood on dried or cracked hands.	1	2	3	4	5
	9. Pricking or cutting myself with sharp objects contaminated with blood or other secretions.	1	2	3	4	5
10. Pressing bleeding sites of HIV-infected patients without wearing gloves.	1	2	3	4	5	
<i>Please answer the following questions about your workplace. 1.Strongly agree 2.Agree 3.Undecided 4.Disagree 5.Strongly disagree</i>						
Safety climate	11. At the health unit where I work, employees, supervisors and managers act together to ensure safer working conditions.	1	2	3	4	5
	12. Prevention of occupational exposure to HIV is a priority for the management of this health unit.	1	2	3	4	5
	13. This health unit offers specific training on blood-borne infections.	1	2	3	4	5
	14. At this health unit, improvisations are not made when it comes to protecting employees from infectious diseases.	1	2	3	4	5
	15. All equipment and materials needed to avoid my contact with HIV are available and easily visible.	1	2	3	4	5
	16. At this health unit, all possible measures are taken to reduce hazardous tasks and procedures.	1	2	3	4	5
	17. I had the opportunity to be properly trained in the use of personal protective equipment to protect me from HIV exposure.	1	2	3	4	5
	18. At this health unit, unsafe work practices are corrected by supervisors.	1	2	3	4	5
	19. Containers for disposal of sharp objects are available and easily accessible at my work unit.	1	2	3	4	5
	20. At this health unit, top management is personally involved in safety activities.	1	2	3	4	5
	21. At this health unit there is a safety committee.	1	2	3	4	5
	22. I feel free to report breaches in safety standards at this health unit.	1	2	3	4	5
	23. My supervisor cares about my safety at work.	1	2	3	4	5
	24. At my unit, the management encourages employees to attend lectures on biosafety.	1	2	3	4	5
	25. At this health unit, unsafe practices are corrected by colleagues.	1	2	3	4	5
	26. My work unit has all the necessary materials and equipment for my protection from exposure to HIV.	1	2	3	4	5
	27. Employees are trained to be alert and recognize potential health hazards at work.	1	2	3	4	5
Interpretation of scores: Domain 1: (4 items) 1, 2, 3, 4 Domain 2: (6 items) 5, 6, 7, 8, 9, 10 Domain 3: (17 items) 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27						
For data analysis: Initially the items 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26 and 27 should be recoded so that the most appropriate response gets the highest score. Thus, higher scores show greater perception of that situation by the healthcare provider.						
Dentists' perceptions of Obstacles to SP, Knowledge of occupational transmission of HIV and Safety climate can be checked for each item of the scale or for each domain, according to the mean values, which are classified as high for values greater than 4.5; intermediate for values from 3.5 to 4.49 and low for values below 3.5.						

Construct validity can be checked by factor analysis, which is the best known method for investigating the dependence of a set of response variables in relation to a smaller number of latent variables. This type of analysis is normally used when there is interest in the behavior of a variable or in groups of variables and their correlation with others of interest¹⁶.

Reliability is another important step in validating an instrument, as it refers to the consistency with which an instrument measures the attribute; in other words, it is the quality of the test scores that suggests that they are consistent enough and free enough from measurement errors to be useful^{16, 19-21}. The smaller the variation produced by the instrument on repeated measurements of an attribute, the greater its reliability.

Although there are several techniques for verifying internal consistency, the most frequently used in the literature is the Cronbach's alpha coefficient. Internal consistency ranges from 0 to 1 and the higher the reliability coefficient, the more accurate the measure is, but values between 0.70 and 0.90 are considered acceptable. Values below 0.70 are considered insufficient, and above 0.90 may indicate redundancy of items¹⁶. In this process, after items were grouped according to the values of factor loadings, internal consistency was verified according to Cronbach's alpha statistic and factors number four and five were excluded as they presented an alpha considered not significant (below 0.70).

It was confirmed that after the instrument was subjected to validation so that it could be applied to dentists, 27 items were maintained, confirming the following theoretical constructs: Obstacles to SP, with 4 items; Knowledge of occupational transmission of HIV, with 6 items and Safety climate, with 17 items. In comparison to the original scale, after being adapted to our environment¹², only the Safety climate scale remained the same. Three items were removed from the Obstacles to SP scale and one item was removed from the Knowledge of occupational transmission of HIV scale.

It is important to emphasize that for its validation, the instrument was applied to dentists who worked in the Primary Healthcare system, which limits the application of the scale to this context. Therefore, it

cannot be generalized, since the issue of 'Safety climate' in the context of primary healthcare has many specificities that differ from a private practice where the dentists is usually independent and directly responsible for management. This situation could also be observed as a limitation in study by Palese et al²².

CONCLUSION

After the validation process, in relation to the psychometric properties, construct validity and reliability were confirmed.

The 48 items initially proposed to compose the instrument underwent exploratory factor analysis by the principal components method, which confirmed five factors in the beginning. However some items were excluded because their factor loading was lower than 0.3.

The 39 remaining items subjected to a new factor analysis were kept and grouped into five factors.

Verification of the reliability and internal consistency of items with two dimensions showed that Cronbach's alpha was below 0.7 and they were excluded (Adherence to SP and Risk perception).

Thus, the adapted instrument after the validation process was composed of 29 items in three domains, namely:

Obstacles to SP, with 4 items ($\alpha=0.76$);

Knowledge of occupational transmission of HIV, with 6 items ($\alpha=0.73$);

Safety climate, with 17 items ($\alpha=0.88$).

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