

CREATION AND VALIDATION OF A QUIZ TO ASSESS COGNITIVE KNOWLEDGE ABOUT SPOTTED FEVER

CONSTRUÇÃO E VALIDAÇÃO DE QUIZ PARA AVALIAÇÃO DE CONHECIMENTO COGNITIVO SOBRE FEBRE MÁCULOSA

CONSTRUCCIÓN Y VALIDACIÓN DE UN CUESTIONARIO PARA EVALUAR LOS CONOCIMIENTOS COGNITIVOS SOBRE LA FIEBRE MACULOSA

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ABSTRACT

Objective: to create and validate a cognitive assessment Quiz about Spotted Fever, targeted at evaluating what students living in and/or traveling to risk cities know about the disease. **Methods:** a methodological study developed in three stages: creation of the Quiz; face and content validation with nine judges, with analysis performed by calculating the Content Validity Index, with a cutoff value of 0.80; and semantic validation, following the DISABKIDS® methodology with 12 students from professional technical courses, with data evaluation performed by means of descriptive statistics, using the Statistical Package for the Social Sciences program. **Results:** the validation process was subdivided into two stages: face and content validation by professionals in the Biology and Education areas, and semantic validation by students attending professional courses. The Quiz was prepared and applied and the results showed a Content Validity Index above 0.80 for all the variables analyzed. In the semantic validation, the Quiz was considered as easy to understand and there were no difficulties filling it in. **Conclusion:** the Quiz created was validated in terms of face, content and semantics, having achieved satisfactory agreement, which guarantees that it is an adequate instrument for the evaluation process on the theme investigated. With this, the expectation is to contribute to disseminating knowledge about the identification of risk and health prevention factors related to Spotted fever.

Keywords: Educational Measurement; Knowledge; Health Education; Rocky Mountain Spotted Fever; Surveys and Questionnaires.

RESUMO

Objetivo: construir e validar um Quiz de avaliação cognitiva sobre Febre Maculosa, voltado para avaliar o conhecimento de estudantes que moram e/ou frequentam cidades de risco para a doença. **Métodos:** estudo metodológico desenvolvido em três etapas: construção do Quiz; validação de aparência e conteúdo com nove juízes, com análise realizada através do cálculo de Índice de Validade de Conteúdo, com valor de corte 0,80; e validação semântica, seguindo a metodologia DISABKIDS® com 12 alunos de cursos técnicos profissionalizantes, com avaliação dos dados realizada por estatística descritiva, tendo sido utilizado o programa Statistical Package for the Social Sciences. **Resultados:** o processo de validação foi subdividido em duas etapas: validação de aparência e conteúdo por profissionais das áreas de biologia e educação e validação semântica por alunos de cursos profissionalizantes. O Quiz foi elaborado e aplicado e os resultados mostraram um índice de validade de conteúdo superior a 0,80 para todas as variáveis analisadas. Na validação semântica, o Quiz foi considerado como de fácil compreensão e não houve dificuldade para o preenchimento. **Conclusão:** o Quiz construído foi validado quanto à aparência, ao conteúdo e à semântica, tendo alcançado concordância satisfatória, o que garante ser um instrumento adequado para o processo de avaliação sobre a temática investigada. Com isso, espera-se contribuir para a difusão de conhecimento acerca da identificação dos fatores de risco e da prevenção da saúde relacionados à Febre Maculosa.

Palavras-chave: Avaliação Educacional; Conhecimento; Educação em Saúde; Febre Maculosa das Montanhas Rochosas; Inquéritos e Questionários.

RESUMEN

Objetivo: construir y validar un Cuestionario de evaluación cognitiva sobre la Fiebre Maculosa, destinado a evaluar los conocimientos de los estudiantes que viven y/o asisten a ciudades con riesgo para la enfermedad. **Métodos:** estudio metodológico desarrollado en tres etapas: construcción del Cuestionario; validación de apariencia y contenido con nueve jueces con análisis realizado mediante el cálculo del Índice de Validez de Contenido, con un valor de corte de 0.80 y validación semántica, siguiendo la metodología DISABKIDS® con 12 estudiantes de carreras técnicas profesionales, con evaluación de datos realizada mediante estadística descriptiva, donde se utilizó el programa Statistical Package for the Social Sciences. **Resultados:** el proceso de validación se subdividió en dos etapas: validación de apariencia y contenido por profesionales de las áreas de biología y educación, y validación semántica por estudiantes de carreras profesionales. El Cuestionario fue diseñado y aplicado. Los resultados mostraron un índice de validez de contenido superior a 0,8 para todas las variables analizadas. En la vali-

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dación semántica, el Cuestionario se consideró fácil de entender y no hubo dificultades para completarlo. **Conclusión:** el Cuestionario construido fue validado en cuanto a apariencia, contenido y semántica, habiendo logrado concordancia satisfactoria, lo que garantiza que es un instrumento adecuado para el proceso de evaluación sobre el tema investigado. Con esto, se espera contribuir a la difusión del conocimiento sobre la identificación de factores de riesgo y prevención de la salud relacionados con la Fiebre Maculosa.

Palabras clave: Evaluación Educativa; Conocimiento; Educación en Salud; Fiebre Maculosa de las Montañas Rocosas; Encuestas y Cuestionarios.

INTRODUCTION

The increase in the human population, with the intensification of trade and travel, changes in the terrestrial habitat, pollution and the expansion of animal production, has favored the emergence of zoonotic diseases, including Spotted Fever (SF). It is recognized by its high lethality and by the increase in its incidence and prevalence in the last 10 years, both in the world and in Brazil, revealing itself as a health challenge.¹

SF has the *Rickettsia rickettsii* bacterium as etiologic agent and the tick of the *Amblyomma spp.* Species as vector, which can infest human beings in the larva and nymph phases (the last phase of the cycle before adulthood). Among the parasitized animals, capybaras play an important role in the epidemiological chain of the disease since, in addition to being hosts, they are natural reservoirs of the bacterium.²

In Brazil, the Southeast region presents the highest incidence of SF in the country, with 1,072 cases notified between 2009 and 2019, of which 719 were recorded in the state of *São Paulo*. During this same period, 1,506 cases were recorded in the country; 523 of them evolved to death, accounting for an approximate 35% lethality rate. Alarmingly, the state of *São Paulo* confirmed 104 cases only in 2018, of which 58 evolved to death, surpassing the estimated lethality rate of the country.³

Between 2007 and 2019, the *Campinas* region notified the highest numbers of the disease in the state of *São Paulo*. Among the cities from this region we have *Campinas* (87 cases), *Valinhos* (47 cases), *Santa Bárbara d'Oeste* (33 cases), *Cosmópolis* (27 cases), *Limeira* (22 cases), *Jundiaí* (17 cases) and *Sumaré* (11 cases), totaling 244 cases.³ Consequently, developing health education activities about SF in this territory assumes important social relevance, with the possibility of reducing the number of cases of the disease.

As is the case in Brazil, other countries have reported increasing episodes of the disease, such as the USA, Mexico, Argentina, Colombia, Canada, Costa Rica and Panama. The USA recorded an equivalent of 13.2 cases per million people in 2016, a number that is almost eight times higher than for the 2000s.⁴ In relation to lethality, only in the state of Sonora, Mexico recorded 1,394 cases

and 247 deaths from 2003 to 2016.⁵ One study indicates that Argentina presents a lethality rate close to 40%, surpassing Brazil (35%) and Mexico (30%).⁶

It is known that early treatment and diagnosis can reduce the numbers of cases and deaths due to SF. However, it is necessary to offer training to health professionals and health education actions for the population, as the disease has signs and symptoms very similar to others, sometimes more prevalent in our regions, such as dengue, malaria, leptospirosis and viral hepatitis.² To confirm the SF diagnosis, health professionals need to suspect the disease and order specific tests; however, to reduce lethality, antibiotic therapy needs to be initiated before confirmation of the diagnosis, when there is suspicion.¹ As it is a serious disease, where only one case can indicate the existence of an outbreak, SF is a compulsorily notifiable disease in Brazil, through the Information System for Notifiable Diseases (*Sistema de Informação de Agravos de Notificação*, SINAN), and requires epidemiological investigation and rapid intervention.³

Consequently, the educational programs in the SF area have the potential to contribute to prevention and health promotion. When they are implemented with evaluation instruments, such as surveys and questionnaires (to conduct an educational evaluation) combined with the participants' knowledge, they make it possible to measure the effects of the teaching and learning process, as well as to increase attitude changes.⁷ The availability of reliable questionnaires enables their application in the evaluation processes in a clear, objective and organized way, making it possible to improve the teaching-learning process and to collaborate with the health promotion policy in the face of epidemiological and environmental surveillance actions for SF, identified by the Ministry of Health in Brazil.

It is worth noting that an integrative review study conducted to support the current research, with the objective of identifying the diverse scientific evidence regarding the creation and validation of assessment instruments on the cognitive knowledge about SF in the world, did not find papers with this purpose. Important studies were identified that evaluated the population's knowledge with assessment instruments;⁸⁻¹² however, they are not created and validated instruments, and are unavailable in the literature for this purpose. Therefore, this research aims at creating and validating a cognitive assessment questionnaire on SF regarding the content, face, and semantic aspects to evaluate the knowledge of students that live in and/or travel to cities at risk for the disease.

METHOD

This is a methodological study to create a cognitive assessment questionnaire about SF, conducted from March 2018 to April 2019. The questionnaire was entitled as Quiz because the term refers to questionnaires organized with multiple-choice questions, as elaborated in this study.¹³ The construction process of the Quiz for the cognitive assessment about SF included three stages, with three different procedures: creation of the Quiz; face and content validation by the judges' committee; and semantic validation with students. The Quiz was created according to the specific recommendations for the creation and validation of guidance materials for health care.¹⁴

Study population

The population to which the Quiz was addressed was the technical-professional course students from two State Technical Schools (*Escolas Técnicas Estaduais*, ETECs) in the cities of *Americana* (technical-professional courses in Administration, Mechanics and Work Safety) and *Santa Bárbara d'Oeste* (technical-professional Nursing course). In order to choose the courses, intentional non-probability sampling was used, as what interests is the opinion (action, intention, etc.) of certain subjects in the population, not numerical representativeness.¹⁵

The cities were selected for being among those with the highest number of reported SF cases of SF.³ During the period from 2018 to 2020, the city of *Santa Bárbara d'Oeste* recorded eight cases of the disease, with five evolving to death. In turn, the *Americana* city notified 16 SF cases during the same period, resulting in 13 deaths.¹⁶

In addition, both schools receive students from other cities equally considered at risk for the disease, as they have reported the highest number of SF cases in the state in recent years, such as *Campinas*, *Valinhos*, *Cosmópolis*, *Limeira*, *Jundiaí* and *Sumaré*.³ Choice of the population was made because they are opinion-makers and strategic actors in carrying out actions for disease prevention, in the case of students attending the professional Nursing course; and because they can reach different strata of society, as they present a very wide age range from 19 to 52 years old (from single young people without children to married or unmarried adults, with or without children). In Brazil, SF particularly affects the economically active male population, with greater occurrence in the age group of 20 to 49 years old, who frequent areas of forests, rivers and waterfalls in work or leisure activities and with exposure to ticks.¹⁷

Instrument

The Quiz has eight multiple-choice questions with only one correct answer each. They are questions referring to causes, symptoms, diagnosis, treatment and prevention. The open question is “*Have you already had contact with this disease or have any relative/friend that contracted it? What happened to you or to that person who had such contact? Which measures were taken?*”

Creation of the instrument

The process to create the Quiz was supported on a narrative review,¹⁸ whose purpose was to identify the diverse knowledge required to encourage prophylaxis against SF. Thus, the Scientific Electronic Library Online (SciELO), *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) and International Literature on Health Sciences (MEDLINE) information sources were consulted, indexed in the *Biblioteca Virtual de Saúde* (BVS) databases, in addition to *Portal de Saúde Baseado em Evidências* (Portal SBE). For the bibliographic survey of the articles, we resorted to the following Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS); *Promoção da Saúde* (Health Promotion); *Prevenção* (Prevention); *Educação em Saúde* (Education in Health); *Febre Maculosa das Montanhas Rochosas* (Rocky Mountain Spotted Fever) AND NOT *Doença de Lyme* (Lyme's Disease). The search was conducted in April and May 2018.

As inclusion criteria for the review, original articles that addressed the SF transmission chain, signs and symptoms and prophylaxis were selected, with manuscripts published in Portuguese, English and Spanish. Literature review articles, dissertations, book chapters, case studies, manuals and editorials were excluded, as well as publications that did not present the topic addressed in the review in their title, abstract or text.

The articles were selected after using the descriptors and the identification took place in three stages, namely: Stage 1: reading the titles of the studies found and excluding those that did not fit any of the inclusion criteria; Stage 2: reading the abstracts of the studies selected in Stage 1 and excluding those that did not fit the inclusion criteria; and Stage 3: full-reading of the remaining studies from the previous stages and selecting those that fit the inclusion criteria.

A total of 13 searches were performed, of which seven were made with combined descriptors and six with a single descriptor, selecting 26 articles. The literature consultation allowed updating and building knowledge on the topic and required reflection on selection of the content

that would be included, in order to fill the knowledge gap with appreciation of the advancement of science on SF. The studies that were repeated in the different databases were only excluded after full-reading, avoiding exclusion errors. The data from these articles were analyzed in detail using a protocol file created for the study, and the following items were observed: title, author, year, locus, country, objective, methodology and results.

Subsequently, the Quiz structure was defined. This stage aimed at organizing the content to reach a logical presentation order and establish the general format. Consequently, Version 1 of the Quiz was created with six multiple-choice questions, and was handed in to the judges for its evaluation.

Face and content validation of the instrument

We resorted to the model proposed by Pasquali¹⁹ for the face and content validation process. To select the judges, the convenience sampling technique called “snowball” was used, which consists in appointing secondary judges from primary ones and increasing the number of evaluators, like a snowball.²⁰ The primary experts were selected from their profiles in the Lattes Platform (CNPq). Inclusion criteria: professionals from the Biology and Education areas, of both genders, regardless of age, with more than five years of training and active in these areas during the data collection period. Exclusion criterion: professionals that failed to fully answer the Quiz assessment instrument.

An invitation letter was emailed to 20 judges and 14 accepted to take part; the others did not respond within the time frame established (seven days). After accepting, the subjects were presented with the Free and Informed Consent Form (FICF) and, with its signature, the Quiz was also forwarded via email for its analysis and assessment. The time limit established for evaluating the Quiz was 15 days and, after that period, an email message was sent to remind the date. Eventually, nine judges collaborated in the face and content validation process, meeting the recommendations proposed by Pasquali,¹⁹ who advises from 6 to 20 specialists.

For the evaluation of the Quiz, an instrument based on another study was elaborated, with the necessary adaptations, and the judges were able to evaluate the objectives, content (general organization, structure, presentation, coherence and formatting), face and language (signs that express ideas and concepts), as well as clarity, objectivity, ease and understanding of the questionnaire.¹⁹ The instrument items were organized in a five-point Likert scale format, where the judges indicated

whether they totally agreed, partially agreed, neither agreed nor disagreed, partially disagreed or totally disagreed, in addition to a space for suggesting changes.²¹ Regarding the assessment, we requested that the judges analyzed each of the three criteria (Clarity, Pertinence and Face) attributing values from one to five, where 1 represented the worst rating and 5, the best. We considered that items evaluated with values equal to or greater than four met the objectives proposed in the study. The assessment instrument contained additional spaces for suggestions.

The data collection stage took place between August and September 2018. At the end of data analysis, the judges' recommendations were accepted and incorporated, with the subsequent elaboration of Version 2 of the Quiz, with eight multiple-choice questions. This version was re-evaluated by the same group of judges and was only forwarded to the semantic assessment process after such re-evaluation.

Semantic assessment of the instrumento

For the semantic assessment, the methodology described in the *DISABKIDS* and *KIDSCREEN* European projects was employed, adapted to the reality of the current study.²² The semantic assessment took place in February and March 2019 and sought to find out with the subjects (students attending technical-professional courses) the level of understanding and acceptance of the terms, the relevance of the items, the existence of any difficulty and the possible need for adaptations. The purpose of this phase was to identify possible problems understanding the items and the answer categories, in order to implement the adaptations, if necessary.

According to the *DISABKIDS*® manual, the number required to complete this phase is a minimum of three participants for each age group and subset of items from the instrument.²² As age group was not a criterion to differentiate the answers, the students were divided according to the specificities of the courses, that is, the students from the technical-professional Nursing course (health area) were allocated in a subgroup (Group A) and the those attending the technical-professional courses in Administration, Mechanics and Work Safety in another (Group B). The sample was probabilistic and obtained by means of a manual draw, in order to preserve homogeneity between the groups, each one comprised by 6 students. The Group A students assessed questions 1, 2, 3 and 4 from the Quiz, whereas those in Group B evaluated questions 5, 6, 7 and 8 (Table 2). Such division was made so as not to disturb the participants and for the research

no to be tiring, according to the guidance in the *DISA-BIKDS*[®] manual.²²

In the third stage, filling-out was through self-filling and by means of an interview with the researcher, where the students answered the following question: “In your own words, can you tell me what this question means to you?”. Filling-out of the instruments and the interview took place in the school yard during class hours and lasted a mean of 25 minutes.

Análise dos dados

Descriptive statistics was used to analyze the data from the validation by the experts' committee stage, in order to report and summarize the data obtained by means of the Content Validity Index (CVI). The CVI measures the proportion or percentage of judges who agree in relation to certain aspects of the instruments and of its items. The cutoff point recommended in the literature for this type of analysis is 0.80.²³

The questions were scored according to the *Likert* scale, considering their importance degree for comprising the questionnaire. The score was calculated by adding up the answers indicated as 4 and 5 to each item of the questionnaire and dividing by the total sum of the answers given to the items.²³ The following formula was used to calculate the CVI: $CVI = \frac{\sum \text{“4” and “5” answers}}{\sum \text{answers}}$. Within the scope of six or more judges, the validated items should have a CVI value equal to or greater than 0.80.

For the semantic validation, the data were also evaluated by means of descriptive statistics, using the *Statistical Package for the Social Sciences* (SPSS) program, version 17.0.

Ethical aspects

The research was approved in 2010 by the Research Ethics Committee of the *Ribeirão Preto* Nursing School - University of *São Paulo*, following the recommendations set forth in Resolution No. 466/2012 of the National Health Council. Both the judges and the students signed the FICF.

RESULTS

Initially, the Quiz was elaborated by means of an extensive literature review, based on consulting the relevant publications about the topic in the last 10 years. For the bibliographic survey, we formulated the following question: What knowledge is required to encourage prophylaxis against SF? The systematic and encompassing search in the scientific literature allowed identifying the

relevant items about SF related to health promotion and prevention. This consultation allowed updating and building knowledge on the topic and required a reflection on selection of the content that would be included to fill the knowledge gap, valuing the advancement of science on SF.

The studies in the review were quite diverse and mostly focused on encouraging preventive behaviors in individuals who lived in and/or traveled to risk areas, so that they could assist with early medical diagnosis and reduce lethality of the disease. After reading the articles selected, creation of the questions was initiated; initially, six questions related to four areas of importance for health education about SF in the population were prepared: concept of the disease, signs and symptoms, diagnosis and treatment, and prevention. Each question presented four multiple-choice options, where only one was correct.

After creating the Quiz, it was analyzed by specialists in the Biology and Education areas (judges). The committee consisted of six female (66.75%) and three male (33.3%) evaluators. Regarding the “Type of Institution attended” variable, seven judges answered that they had studied in State Institutions (77.8%) and three indicated having studied in Private Institutions (22.2%). In terms of Residency or Specialization, six evaluators reported that, in addition to their MSc and/or PhD degrees, they also have such qualifications (66.7%). All the judges had an MSc degree and six of them were also PhDs (66.7%). Of all nine judges, seven developed their duties in the University of *São Paulo* (USP) and two (22.2%) did so in another Institution.

Table 1 presents the answers given by the judges referring to the face and content validation corresponding to Quiz for each of the questions presented. It was not possible to categorize the *Likert*-type scale format in one of the questions included in the instrument: “Would you like to add or exclude any question to/from the instrument?” Consequently, the possible answers for this question were “Yes” and “No” and 55.6% of the judges chose the “No” answer option.

Table 1 presents the grades assigned by each of the nine judges to the items that, in general, cover the following criteria: Clarity - clear textual expression, easy to understand, precise and intelligible to the reader; Pertinence - relevance to a suitable or appropriate purpose; and Face - exterior configuration characterized by the appearance of the items. All items had CVI values greater than 0.80, the level established as the minimum to characterize them as valid, which indicates excellent consistency

of the items among the judges and shows that the Quiz was considered clear, objective and well-structured.

In the “Do you agree with the answers assigned to each question?” variable, one of the judges chose the “I partially disagree” answer option, assigning it the value of 2. This evaluator suggested that we removed the “I don't know” item as answer option for each question of the instrument. According to him, the item was unnecessary, as lack of knowledge can eventually be assessed by means of the selection of wrong or partially wrong answers. Thus, he justified: *“This type of item can turn into a hindering element when the participant is not interested in the topic or is in a hurry to answer the instrument”* (Judge 1).

In the “Would you like to add or exclude any question to/from the instrument?” variable, four judges suggested adding questions. One of them indicated an open question to be answered by the participants, justifying that *“This question may, without the help of luck, record the participants' real knowledge”* (Judge 2). Another evaluator included the etiological agent species: *“Rickettsia rickettsii, a gram-negative bacterium, an obligate intracellular parasite”* (Judge 3). However, when considering the target audience (mostly students attending technical courses, some of them even outside the health area), this information was not considered necessary. It is worth recalling that the main objective is to assess cognitive knowledge to encourage SF prophylaxis.

Judge 4 suggested adding two questions, one of them referring to Epidemiological Surveillance and Compulsory Notification, with the following reason: *“I believe that knowledge about surveillance is important not only for students and professionals, but for all citizens”* and another regarding proper handling when a tick bites: *“it is really important that people know the correct way to remove ticks”* (Judge 4). Also referring to this variable, Judge 5

suggested adding a question referring to contact with the disease: *“I find it interesting to ask if the participants had already had contact with the disease or if any relative/ friend had such contact in their life”* (Judge 5).

No item was removed as the result of this stage; however, they were re-evaluated following the judges' suggestions. Subsequently, two additional questions were incorporated, giving rise to Version 2 of the Quiz (with eight items), which was again forwarded to the judges, with no indication for suggested changes. Version 2 of the Quiz was assessed by the target audience, and 12 students took part in the semantic evaluation. Of these, six were students were attending first year of the professional Nursing course (Group A); two students were in first year of the professional Mechanics course, two were in first year of the professional Administration course, and another two were in first year of the professional Work Safety course (Group B). *caracterizá-los como válidos, o que indica uma ótima coerência dos itens entre os juízes e mostra que o Quiz foi considerado claro, objetivo e bem estruturado.*

The participants considered the questionnaire as Very Good (66.6%) or as Good (33.4%); 75% reported comprehension ease and 25% considered that the questions were sometimes easy to understand. Regarding the answer category, all the students (100%) stated not having any comprehension difficulty and thought that the questions were important to improve knowledge about SF. No participant suggested changing and/or adding anything in the Quiz. Through the analysis of the answers referring to the general impression form, it was observed that the students considered the Quiz important to assess the knowledge about SF; however, they some had difficulty understanding certain items. Subsequently, the specific impressions were analyzed, as shown in Table 2.

Table 1 - Distribution of the answers given by the judges in the face and content validation corresponding to the instrument for each of the questions presented, according to CVI. Ribeirão Preto - SP, 2022

Questões escala Likert	Notes									CVI
	J1	J2	J3	J4	J5	J6	J7	J8	J9	
The Quiz items are suitably grouped?	5	5	5	5	5	5	5	5	5	1.00
Was there coherence across the questions presented?	5	5	4	5	5	5	4	4	2	1.00
Do you agree with the answers assigned to each question?	5	5	5	5	5	5	5	5	5	0.89
Are the items addressed in the questionnaire objective and clear?	5	5	5	5	5	5	4	4	4	1.00
Does the Quiz allow identifying the students' knowledge about Spotted Fever?	5	5	5	5	5	5	5	5	5	1.00
Is the Quiz easy to read and understand?	5	5	5	5	5	5	4	4	4	1.00
Are the questions important to assess knowledge about Spotted Fever?	5	5	5	5	5	5	4	4	4	1.00

Source: Research data, 2019. Key: J: Judge; CVI = Content Validity Index.

In relation to relevance, the students identified all the questions as important (Table 2), considering the Quiz suitable to assess knowledge referring to SF. The open question, “Could you tell me in your own words what this question means to you?”, did not contribute relevant results regarding the meaning, as the students' answers only repeated the question itself, which was discarded from the analysis.

Validation of the Quiz on SF by the judges and the target audience (semantic validation) showed that it has clear and concise information, being considered accessible by the participants, together with clarity of the content and its appropriate format, with the possibility of contributing to knowledge promotion.

Tabela 2 - Validação semântica do questionário segundo o público-alvo, dividido em subconjuntos A (n=6) e B (n=6). Ribeirão Preto - SP, 2022

Item	Is this important for your situation?			Did you have any difficulty understanding this question?		Are the answer options clear and consistent with the question?	
	Yes	Sometimes	No	Yes	No	Yes	No
Subset A							
A1. What is Spotted Fever?	6	0	0	0	6	6	0
A2. How is Spotted Fever transmitted?	6	0	0	0	6	6	0
A3. Which are the initial and most common symptoms of Spotted Fever?	6	0	0	0	6	6	0
A4. In relation to the Spotted Fever diagnosis and treatment, it is correct to assert that:	6	0	0	0	6	6	0
Subset B							
B1. Indicate the prevention means for Spotted Fever:	6	0	0	0	6	6	0
B2. Is Spotted Fever a compulsory notification disease? Why? Who can notify cases?	4	1	1	4	2	6	0
B3. What should you immediately do in case you find a tick in your body?	6	0	0	1	5	6	0
B4. Have you already had contact with this disease or know someone who has?	5	1	0	1	5	6	0

Source: Research data, 2019.

The final version of the Quiz is described below (free translation into English):

1 - What is **Spotted Fever**?

- A disease caused by a virus.
- A disease caused by a bacterium.
- A tick-transmitted disease.
- A genetic disease.

2 - How is Spotted Fever transmitted?

- Human beings are contaminated by direct contact with aerosols/secretions from capybaras/horses/skunks.
- Human beings are infected through bites of capybara/horse/skunk fleas.
- Human beings are infected through bites of capybara/horse/skunk ticks.
- Human beings are contaminated through bites of *Aedes aegypti* mosquitoes.

3 - Which are the initial and most common symptoms of Spotted Fever?

- Moderate to high fever/Muscle pain/Headache/Spots in the body/Nausea and vomiting.
- Moderate to high fever/Nausea and vomiting/Spots in the body/Hunger/Pain in the eyes/Headache.
- Muscle pain/Lack of appetite/Pain in the eyes/Low fever/Itching.
- Muscle pain/Low fever/Itching/Nausea and vomiting/Hunger/Fatigue.

4 - In relation to the **Spotted Fever** diagnosis and treatment, it is correct to assert that:

- Treatment with an antibiotic should be initiated as soon as possible, as this disease can have a rapid evolution and high lethality (it can lead to death).
- For being a hard-to diagnose disease, it is better to wait for the laboratory test results to initiate the treatment.
- As this is a rare disease, it is easy to diagnose.
- Diagnosis is easy, as no other diseases share similar symptoms.

5 - Indicate the prevention means for Spotted Fever:

- Putting screens on doors and windows of houses in risky places/Not leaving standing water in containers/Trimming vegetation/Wearing light-colored clothes, long pants with the hem inside the socks or wearing boots when visiting risky areas.
- Taking an antibiotic/Avoiding contact with dogs living in risk areas/Avoiding the areas signaled as flea-infested/Using light-colored clothes.
- Avoiding areas marked as tick-infested areas/Avoiding contact with places with capybaras/Trimming vegetation/Wearing light-colored clothes, long pants with the hem inside the socks or wearing boots when visiting risk areas.
- Trimming vegetation/Putting screens on doors and windows of houses in risky places/Avoiding contact with

capybaras or the places where they live/Not leaving standing water in containers.

6 - Is Spotted Fever a compulsory notification disease? Why? Who can notify cases?

The disease should be notified via the fastest possible means. It is mandatory to conduct an investigation with active search to avoid the occurrence of new cases and deaths. Any person aware of a suspected or confirmed case of the disease.

The disease should be notified via the fastest possible means. Investigation is not mandatory, as this is not a severe disease. Any person aware of a confirmed case of the disease.

This is not a compulsory notification disease, as it is not a rare disease.

The disease should be notified via the fastest possible means. It is mandatory to conduct an investigation with active search to avoid the occurrence of new cases and deaths. Only health professionals can notify cases.

7 - What should you immediately do in case you find a tick in your body?

Seek a health unit for the professionals to remove the tick from your body.

Remove the tick with tweezers making a gentle twisting movement, check that no pieces of the tick remain and place it in a container with alcohol.

Crush the tick to kill it as quickly as possible, preventing it from transmitting the disease.

Burn the tick fixed on the skin, so that it detaches easily.

8 - Have you already had contact with this disease or have any relative/friend that contracted it? What happened to you or to that person who had such contact? Which measures were taken?

DISCUSSION

Development and validation of the Quiz were structured to meet the current need for evaluation, offering new possibilities for preventive actions related to SF. In this way, it is about the creation of an innovative tool since, in the bibliography review, no evidence was found of the existence of instruments that would allow assessing cognitive knowledge about the disease. Therefore, the Quiz can be used for a diagnostic analysis to identify the gap in the target audience's knowledge, offering significant subsidies for the planning of educational actions, as well as being used before and after the actions to evaluate the change in cognitive knowledge regarding SF. bem como empregado antes e após as ações para avaliar a mudança do conhecimento cognitivo referente à FM.

For the development of educational actions, it is necessary to identify the information needs referring the target audience's knowledge on the topic to encourage more meaningful learning.²⁴ For a diagnostic evaluation, it is essential to pay attention to quality of the instrument, as it needs to focus on the topic; present a logical sequence, starting from general questions to more specific

topics; have a coherent structure; to be organized; and use appropriate language. Long sentences can lead to dispersion and make reading tiring, and a long instrument can compromise willingness to answer it.²⁵

Creation of the Quiz sought to meet these premises, as the content was elaborated with an increasing sequence of deepening, using clear and direct language. The questions were objectively formulated and only used words that made it easier to understand what was being evaluated, without allowing dubious interpretations. Size of the Quiz was also considered so that its filling-in was quick and simple, which resulted in a questionnaire with eight multiple-choice items, whose use in educational practices can be a practical and objective technique, as there is no subjectivity-related interference, allowing many individuals to be evaluated at once, which also contributes to time optimization.²⁶

Based on the above, it is noted that the creation of valid and reliable instruments is not an elementary task and that commitment to using the scientific method is essential to elaborate evidence-based material based.²⁷ Assessments exert a strong influence on the teaching-learning process, as learning difficulties are seen as adverse conditions that can hinder development and, therefore, should be designed to foster desirable skills.²⁷

Seeking to confer greater reliability to the questionnaire, it was submitted to a judges' committee, setting up the face and content validation stage. The analysis resulted in a positive evaluation and showed that most judges agreed on relevance of the items through satisfactory CVI values, in line with what is recommended in the literature to be considered valid.²⁸ It is necessary to emphasize that, although the Quiz was well evaluated by the judges, they recorded their contributions, enriching the result and improving its applicability.

The Clarity index generated by the target audience's answers showed that the Quiz is easy to understand for what is intended to evaluate. Thus, it is understood that it can be used to analyze cognitive knowledge about SF and is valid in terms of content, face and semantics, and may be useful for other researchers, educators and/or health professionals who wish to plan actions for prevention and health promotion.

The need for validation of instruments by specialists guarantees quality for their application, for the result to be an adequate tool for the teaching-learning process.²⁹ As an example, a study carried out by researchers from Malaysia created a questionnaire to evaluate pilgrims' knowledge, attitude and practice in relation to respiratory tract infections. The methodological process covered in

this study corroborates what was presented, as the potential of both questionnaires is to contribute to improving the participants' knowledge regarding disease prevention.³⁰ Another similar study elaborated and validated an instrument for validating educational content in health, showing that the evaluation by specialists presented good reliability and that the instrument could contribute to the practice of researchers and professionals in the health areas in the elaboration of educational contents.³⁰

Regarding semantic validation, this is an important stage in the creation of assessment instruments, being essential to verify that all items are understandable by representatives of the target audience.³¹ Semantic validation offers an interpretation of reality, contributing to more easily achieving the objectives proposed.^{28,32} A study limitation, however, was the participants' difficulty in the specific semantic validation interview, where they had to say in their own words what that question meant. All participants had difficulties understanding and ended up repeating the question itself, but it is believed that this did not significantly interfere with the research result, although it is suggested to consider such aspects in other research studies that will use the methodology.

As a limitation of the Quiz created, its exclusive objective to only assess cognitive knowledge about SF stands out, not evaluating other domains, such as attitudes and behaviors towards the disease. Therefore, psychometric analysis, construct validity, pilot study and reliability test were not performed. Thus, for future research studies, it is suggested to carry out a pilot study and a reliability test.

The main differential of the Quiz that was created is in the population selected as judges, as they live in areas considered to be at risk for the disease. The cities were Santa Bárbara d'Oeste and Americana, which are among those with the highest number of reported SF cases SF in Brazil. Furthermore, some of the students who participated in this study are from technical-professional Nursing course and will soon become health professionals, being able to assist in medical diagnosis and act together with nurses in the planning of health education actions for SF, as they are part of the multiprofessional team and of the collective and articulated work with the other members.³¹ The other group of students are from the technical courses of Administration, Mechanics and Work Safety and can be knowledge multipliers with their peers to think about health promotion actions in the different contexts where they are inserted, contributing with behavioral changes and, consequently, with reducing lethality of the disease.³³

CONCLUSION

The questionnaire produced in this study, called Quiz, was elaborated and validated and reached satisfactory agreement, which guarantees that it is an adequate instrument for the evaluation process on the investigated theme. With this, it is expected to contribute to the dissemination of knowledge about the identification of risk factors and health prevention related to SF, as well as to assist in the change of coping with the disease in a reliable, contemporary and up-to-date way.

The study brought about a relevant contribution to the specific knowledge area because it produced an instrument capable of easing and supporting the planning of health education actions to promote changes in the SF epidemiological scenario. Finally, the Quiz developed aims at easing the evaluation of learning about prevention of the disease, ensuring greater reliability to identify the participants' cognitive skills. It may also be used to verify the knowledge gap and to help with an assistance focused on health promotion and prevention for SF, still insufficient in Brazil.

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