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BOARD GAME ON HEALTHY LIFESTYLE FOR PEOPLE WITH CORONARY ARTERY DISEASE

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ABSTRACT

Objective: to develop and analyze content and face validity evidence of a board game to promote healthy lifestyle habits for patients with coronary artery disease.
Method: this is a psychometric study of development and validity of a board game for health education. Data collection was carried out between October 2021 and January 2022. Initially, the game rules were described and, sequentially, themes related to cardiovascular prevention were identified, used as a basis for card development. The game was submitted to assessment by 14 experts in terms of clarity, theoretical relevance, practical relevance, image visibility and relationship between image and text, through a Likert scale score. The content validity coefficient was calculated for each round, with a coefficient greater than 0.57 being considered valid. New assessment rounds were performed until the appropriate coefficient was reached.
Results: the board game was built containing images of anthropomorphized hearts alluding to healthy lifestyle habits and 45 spaces. A total of 69 cards were developed containing the themes of healthy eating, physical activity and the importance of smoking and alcohol cessation. In the first round of assessment, three cards did not reach the minimum content validity coefficient. They were reformulated and sent to a second round of assessment, and was considered validated in this new round.
Conclusion: the game, its rules and its content showed adequate content validity evidence after the second round. Further studies to analyze its effect on lifestyle modification should be carried out.

DESCRIPTORS: Coronary artery disease. Health education. Validation study. Games, experimental. Primary prevention. Secondary prevention.

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JOGO DE TABULEIRO SOBRE ESTILO DE VIDA SAUDÁVEL PARA PESSOAS COM DOENÇA ARTERIAL CORONARIANA

RESUMO

Objetivo: desenvolver e analisar evidências de validade de conteúdo e de face de um jogo de tabuleiro para promoção de hábitos saudáveis de vida para pacientes com doença arterial coronariana.
Método: estudo psicométrico de desenvolvimento e validação de um jogo de tabuleiro para educação em saúde A coleta de dados foi realizada entre os meses de outubro de 2021 e janeiro de 2022. Inicialmente, foram descritas as regras do jogo e sequencialmente foram identificados temas relacionados à prevenção cardiovascular, usados como base para o desenvolvimento de cartas. O jogo foi submetido à avaliação de 14 especialistas em relação à clareza, relevância teórica, pertinência prática, nitidez das imagens e relação da imagem com o texto, por meio da pontuação em escala de *Likert*. Foi calculado o coeficiente de validade de conteúdo para cada rodada, sendo considerado válido um coeficiente superior a 0,57. Novas rodadas de avaliação foram realizadas até que o coeficiente adequado fosse atingido.
Resultados: o jogo de tabuleiro foi construído contendo imagens de corações antropomorfizados aludindo a hábitos saudáveis de vida e 45 casas. Foram desenvolvidas 69 cartas contendo as temáticas de alimentação saudável, atividade física e a importância da cessação do tabagismo e do álcool. Na primeira rodada de avaliação, três cartas não atingiram o coeficiente de validade de conteúdo mínimo. Foram reformuladas e enviadas para a segunda rodada de avaliação, sendo consideradas validadas nessa nova rodada.
Conclusão: o jogo, suas regras e seu conteúdo apresentaram adequadas evidências de validade de conteúdo após a segunda rodada. Estudos posteriores para análise do seu efeito na modificação do estilo de vida devem ser realizados.

DESCRITORES: Doença da artéria coronariana. Educação em saúde. Estudo de validação. Jogos experimentais. Prevenção primária. Prevenção secundária.

JUEGO DE MESA DE ESTILO DE VIDA SALUDABLE PARA PERSONAS CON ENFERMEDAD DE LAS ARTERIAS CORONARIAS

RESUMEN

Objetivo: desarrollar y analizar evidencias de validez de contenido y apariencia de un juego de mesa para promover hábitos de vida saludables en pacientes con enfermedad arterial coronaria.
Método: estudio psicométrico de desarrollo y validación de un juego de mesa para educación en salud. Os dados se recopilaron desde octubre de 2021 hasta noviembre de 2022. Inicialmente, se describieron las reglas del juego y, en forma secuencial, se identificaron temas relacionados con la prevención cardiovascular, utilizado como base para el desarrollo de gráficos. El juego fue sometido a la evaluación de 14 especialistas en términos de claridad, pertinencia teórica, pertinencia práctica, nitidez de las imágenes y relación entre la imagen y el texto, a través de la puntuación de la escala Likert. Se calculó el coeficiente de validez de contenido para cada ronda, considerándose válido un coeficiente superior a 0,57. Se realizaron nuevas rondas de evaluación hasta alcanzar el coeficiente adecuado.
Resultados: se construyó el juego de mesa que contenía imágenes de corazones antropomorfizados alusivos a hábitos de vida saludables y 45 casas. Se desarrollaron 69 cartas que contenían los temas de alimentación saludable, actividad física y la importancia de dejar de fumar y de beber alcohol. En la primera ronda de evaluación, tres letras no alcanzaron el coeficiente mínimo de validez de contenido. Fueron reformulados y enviados a la segunda ronda de evaluación, considerándose validados en esta nueva ronda.
Conclusión: el juego, sus reglas y su contenido mostraron evidencia adecuada de validez de contenido después de la segunda ronda. Se deben realizar más estudios para analizar su efecto en la modificación del estilo de vida.

DESCRIPTORES: Enfermedad de la arteria coronaria. Educación en salud. Estudio de validación. Juegos experimentales. Prevención primaria. Prevención secundaria.

INTRODUCTION

Coronary artery disease (CAD) represents an important cause of global and national morbidity and mortality. In Brazil, in 2022, there were 161.958 hospitalizations for acute myocardial infarction (AMI) with 14.590 deaths attributed to CAD[1]. In 2015, AMI, a complication of CAD, was the disease that most generated expenses for the Unified Health System (SUS - *Sistema* Único *de Saúde*), with a total of approximately 22.4 billion *reais*[2].

Considering the costly scenario caused by cardiovascular diseases (CVD) and especially by AMI, the need to manage modifiable risk factors closely related to the genesis and outcome of this disease is highlighted. Thus, dyslipidemia, type 2 diabetes mellitus, hypertension, sedentary lifestyle, smoking, excessive alcohol intake, stress and inadequate nutrition with high-fat, high-calorie and high-sodium foods are elements subject to behavioral transformation through health education[3].

Guiding patients and their families regarding the incorporation of a healthy lifestyle is part of a process called health education, which can be defined as an educational and participatory approach that aims to help health consumers learn how to incorporate health-related behaviors (knowledge, skills and/or attitudes) in daily life with the aim of promoting good health, increasing their competence and confidence for self-management[4].

This educational process is characterized by a systematic, sequential, logical, planned and scientifically based course of action that consists of two main interdependent operations: teaching and learning that together play their roles whose result leads to changes in mutually desired behaviors, i.e., this educational process aims to achieve changes in individuals' knowledge, attitudes and skills[5].

The educational process aimed at behavioral change with a focus on promoting cardiovascular health can be based on one or more nursing theories, with Nola Pender's medium-range theory called Health Promotion Model (HPM) being one of those that stand out in promoting the incorporation of a healthy lifestyle[6].

This health promotion model is based on three theories of human behavior, i.e., value theory that assumes that people are more susceptible to changes based on a pre-established goal, social cognitive theory that is characterized in the confidence that a person has in their ability to successfully perform an action, being considered as one of the variables for health-promoting behavior and rationalized action and planned action that reinforces that a patient's behavior is a result of their conscious choices[6–7].

Educational interventions are necessary to achieve the three theories that make up Nola Pender's HPM and these actions can be carried out in different ways, including face-to-face consultations, consultations via telephone, through applications for mobile phones, messages to mobile phones and board games or electronic games[8–10].

Systematic reviews[8–9] found that telehealth techniques used for health education of people with CAD are effective in promoting blood pressure and diet management, reducing abdominal circumference, total cholesterol, triglycerides and body mass index, improving medication compliance and physical activity practice. Techniques included phone calls, text messages, web pages, cell phone apps, and telemonitoring and primarily addressed diet, exercise, symptom management, anxiety, depression, and psychosocial support[9].

Educational interventions in health aim to increase the health literacy degree, which can be defined as the degree to which individuals have the ability to obtain, process and understand information and basic health services necessary to make appropriate health decisions[11]. The choice of the type

of health intervention should be based on a person's literacy level, culture, language, socioeconomic level and also on the digital literacy degree, because depending on the technological resource used for health education, this can promote educational development or even be a barrier when there is a lack of knowledge in technology use[11].

Among the various forms of health education for patients with chronic diseases such as CAD, the strategy of educational games can be used for this purpose, given the evidence of improvement in knowledge and self-care from the use of educational games[10].

Despite the available evidence, studies on the validity of educational games in the area of cardiology are scarce, and no studies on the development and validity of board games for the Brazilian population that aim to equip patients with CAD with the necessary tools with regard to self-management and self-care of their health. This study aimed to develop and analyze content and face validity evidence of a board game to promote healthy lifestyle habits for patients with CAD.

METHOD

This is a psychometric study of the construction and analysis of validity evidence of a health education board game for patients with CAD. A psychometric study is understood to be those studies that aim to assess the metric properties of a given instrument or educational material adapted or developed, i.e., verify whether a given instrument or educational material gathers adequate validity evidence, which can be understood as the degree to which the evidence and theory related to the instrument's main construct support the product's applications, and it is recommended that the first phase of these studies be the content validity evidence analysis[12–13]. The project was approved by the Research Ethics Committee of the university under study, and was developed from October 2021 to November 2022.

The study's first phase was the game development stage. In this regard, recommendations for CVD prevention were investigated in national and international guidelines, which, in turn, guided the game content. Concomitantly, a prototype of the type of game, its rules and theoretical content was developed[14–21]. Later, a professional was hired to design the game and its cards.

After designing the game and its content, an electronic form was created using Google Forms® containing all the game rules, the game board and the game cards for content and face validity evidence analysis by health professionals. Potential experts were selected from a search on the CNPq portal *Plataforma Lattes*, using the terms "coronary disease", "health education" and "cardiology", based on prior knowledge of researchers who publish in the area of CVD prevention, as they are co-authors and/or participants of study group of these researchers or by indication of other experts. Data collection was carried out between October 2021 and January 2022.

All participants were invited via email and signed an Informed Consent Form online before accessing the Google Forms® topics. Experts assessed the game cards, the game board and the game rules in relation to clarity, theoretical relevance, practical relevance, image visibility, font visibility and relationship of the text to the image through a 3-point Likert-type: 1 for inadequate, 2 for partially adequate and 3 for adequate. Definitions regarding clarity, theoretical relevance and practical relevance were made available in the header of the form[12–13]. For each question on the form, an open field was made available for suggestions by experts to improve the material.

Expert characterization was carried out using descriptive statistics, including absolute and relative frequencies for qualitative variables, and mean and standard deviation for quantitative variables.

For the analysis of agreement among evaluators, the Content Validity Ratio (CVR) calculation was chosen, which is characterized by a linear transformation of judges' agreement that varies from -1 to +1, where values close to 1 correspond to perfect agreement. The CVR calculation was carried out according to the following formula CVR=ne- (N/2)/ N/2, in which ne – number of experts who marked the score 3 and N - number of judges[22–23].

In this study, we chose to calculate the CVR proposed by Lawshe[17] and revised by Ayre, which provides the degree of statistical significance of content validity and the acceptable critical CVR value according to judge panel size. This calculation ensures that judges' agreement does not happen by chance, and for this purpose, a critical CVR table is used, which is the minimum CVR value such that the level of agreement exceeds the chance for a given item and for a given alpha (type I error probability, one-tailed test with p-value=0.05)[22–23].

Considering the sample of 14 experts, the critical CVR considered for the two rounds was 0.57 at a significance level of 0.04[22–23]. Topics that did not reach the necessary critical CVR were reformulated according to evaluators' suggestions and submitted to a second round of assessment with the same participants of the first round.

RESULTS

A priori, the idealized game was a board game because it allows the interaction of patients and family members in the learning process, and the game rules were based on other recreational board games. This game was initially titled "JESC *EDUCA-COR*" (*Jogo de Educação em Saúde Cardiovascular* (Cardiovascular Health Education Game), linked to the *EDUCA-COR* extension project) of the university. The game design as well as the color palette and illustrations were developed by a hired professional, following the researchers' guidelines and preferences.

The game consists of a dispute between two to three players, in which the one who first reaches the end of the board wins. Once the players are defined, they must roll a dice: the one who rolls the highest number starts. Then, the player must roll the dice again and go through the corresponding number of spaces. After advancing the spaces, the player must answer a question from a pile of cards. The opponent will read the card, which contains a statement that must be judged as true or false by the player. In every footnote of the cards, there is a justification written in smaller font. If the player gets the statement right, they can advance one more space, otherwise, they must remain in the same space.

In total, 69 cards were produced, covering the healthy eating, physical activity and tobacco and alcohol use domains (Supplementary Material 1). In the healthy eating domain, 31 cards were prepared. Considering the CVD prevention guidelines, the food guide for the Brazilian population, the cardioprotective food guide, statements focused on encouraging healthy and minimally processed food consumption, identifying foods that should be avoided and consumed in moderation, eating frequency, healthy routines during meals and way of preparing food (Figure 1)[3,7–13].

In the physical activity domain (24 cards), aspects such as the importance of physical exercise for heart health, examples of physical activities and the importance of stretching and use of suitable clothes for physical exercise as well as clinical warning signs during physical activity stood out (Figure 2).

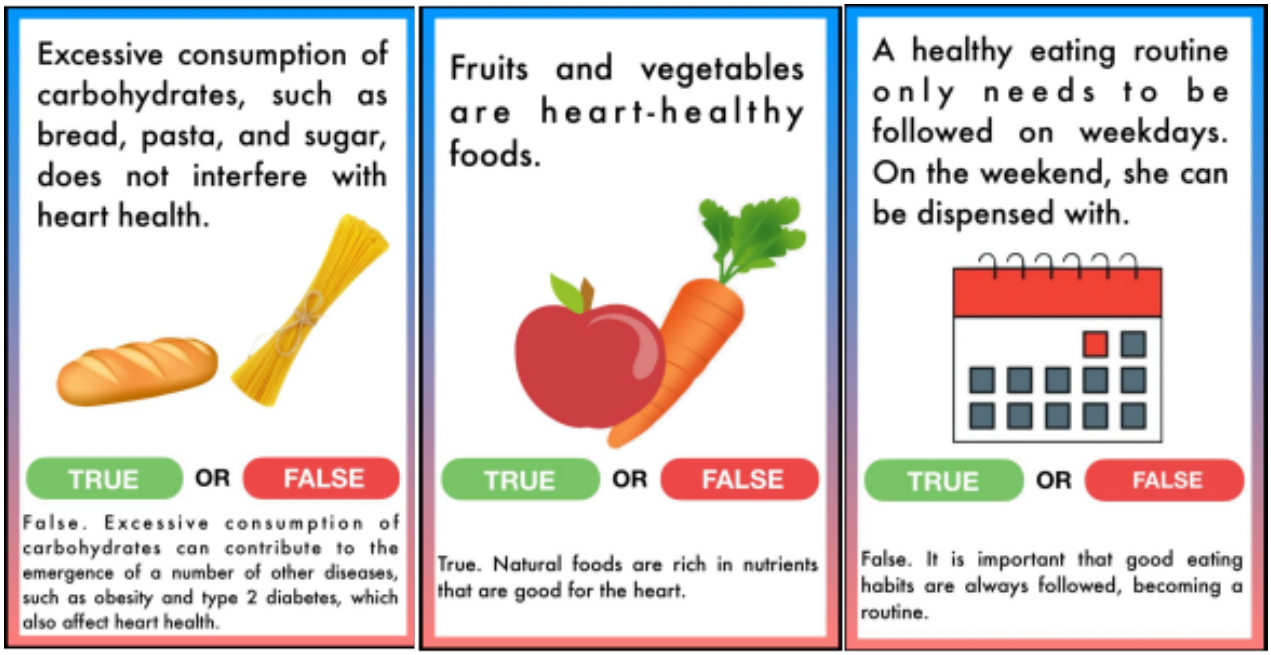

Figure 1 - Examples of cards that addressed healthy eating**.**

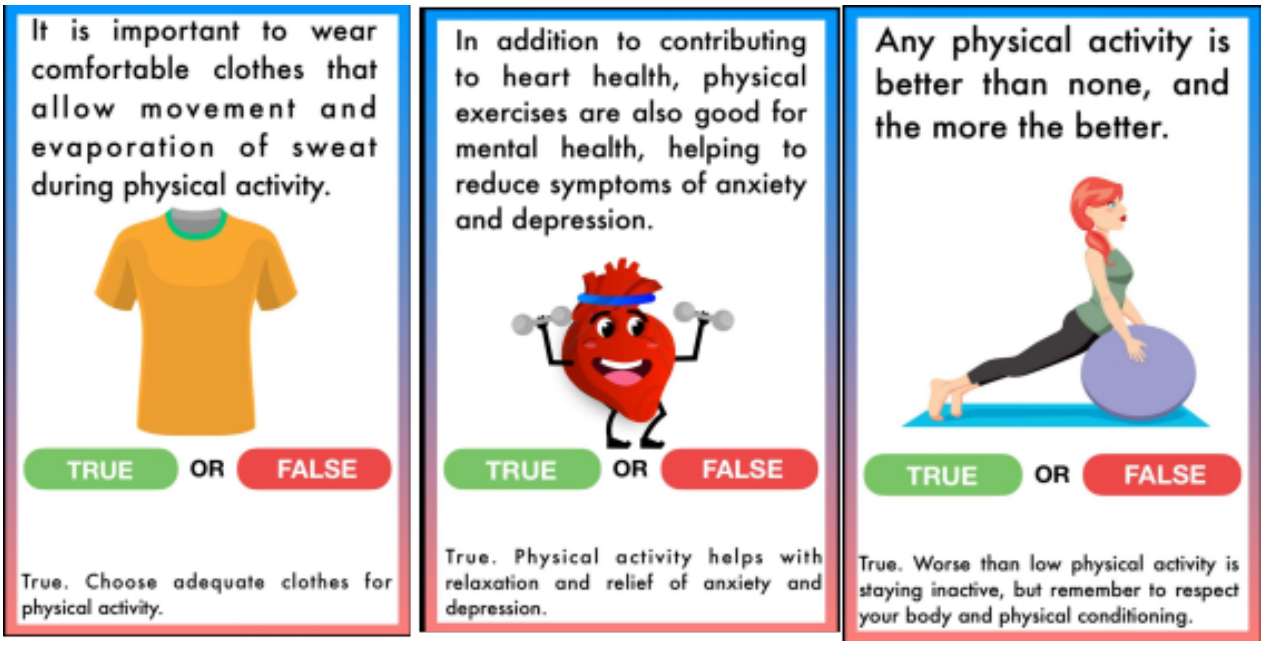

Figure 2 - Examples of cards that addressed physical activity practice**.**

For the tobacco and alcohol consumption domain, 14 cards were developed, which addressed the harm caused to health by cigarettes and alcohol, the positive consequences of ceasing smoking and alcoholism, and the therapeutic options available and subsidized by SUS for nicotine and alcohol dependence treatment.

After developing the game and the cards, they were sent to 26 professionals, of which 14 responded, most of them female, nurses, with an mean age of 39 years and with an education degree at the *stricto sensu* level and specialization in cardiology (Table 1).

Table 1 - Expert sociodemographic characterization. São Paulo, SP, Brazil, 2022. (n=14)

Variable	
Sex n(%)	
Female	12 (85.7)
Male	2 (14.3)
Age (years), mean (SD)	39.7 (5.4)
Academic background, n(%)	
Nurse	13 (92.8)
Nutritionist	1 (7.2)
Professional activity, n(%)	
Assistance only	4 (28.5)
Teaching only	1 (7.1)
Management only	1 (7.1)
Research only	1 (7.1)
More than one area	7 (49.7)
Highest title, n(%)	
S*tricto sensu* graduate degree	8 (57.0)
Specialization	6 (42.8)
Specialty area, n(%)	
Cardiology only	9 (64.2)
More than one specialty	4 (28.5)
Nutrition in public health	1 (7.1)

In the analysis regarding the game title - first presented as "*JESC EDUCA-COR*" -, clarity and practical relevance did not reach satisfactory CVR, and experts' suggestions to change the name of the game to "*DESAFIO EDUCA-COR*" were accepted. As for game appearance and rules, all questions achieved a satisfactory CVR (see Table 2); however, judges' suggestions to remove the image of red blood cells that illustrated part of the board were met, arguing that they were perhaps confusing to players' understanding.

Table 2 - CVR of the first and second round in relation to game title, rules and appearance in relation to indicators assessed by experts. São Paulo, SP, Brazil, 2022**.**

	Game title		Game rules		Game appearance	
	1st round	2nd round	1st round	2nd round	1st round	2nd round
Clarity	0.14	1.0	0.57	1.0	*	*
Theoretical relevance	0.71	1.0	1.0	1.0	*	*
practical relevance	0.42	1.0	1.0	1.0	*	*
Image visibility	*	*	*	*	0.85	1.0
Font visibility	*	*	*	*	1.0	1.0
Relation of the figures with the game	*	*	*	*	0.71	1.0

Caption: *not applicable

The final version of the board appearance can be seen in Figure 3.

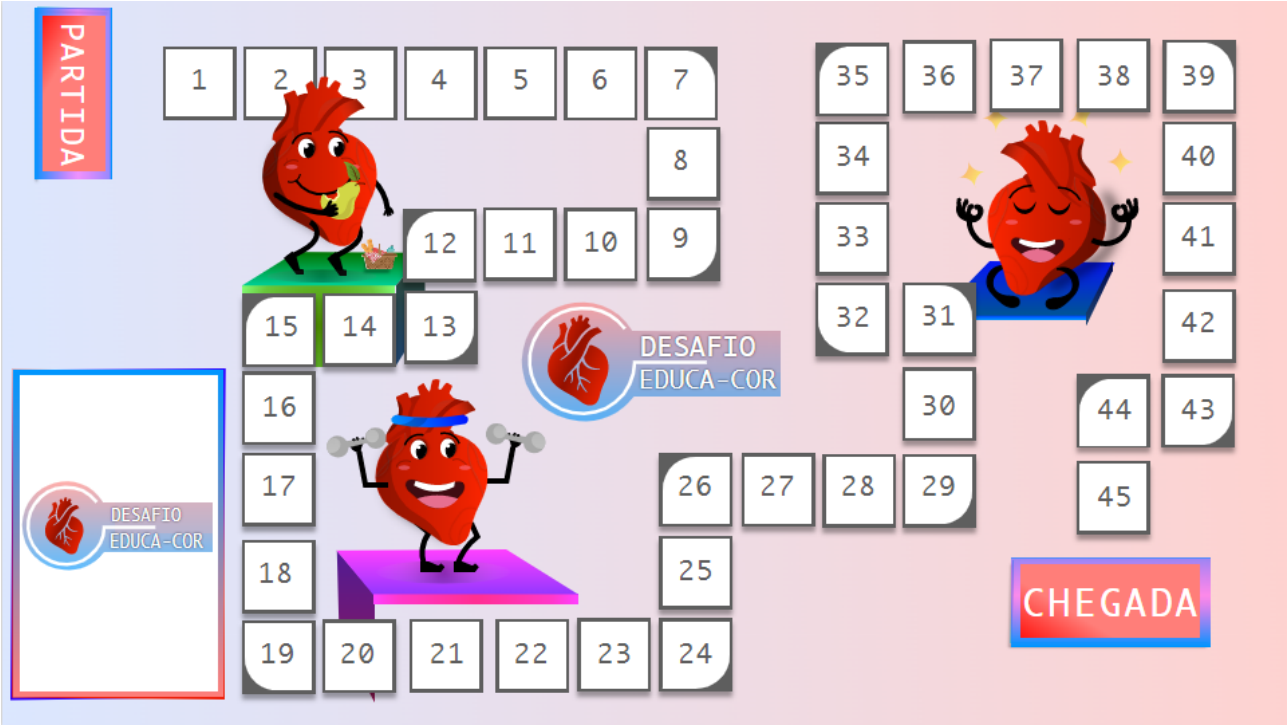

Figure 3 - Final version of the game board after suggested modifications. São Paulo, SP, Brazil, 2022**.**

Of the 31 cards from the food domain, three did not obtain the minimum CVR value to be considered valid. There was disagreement regarding the content of one card and the images of two cards. The disagreement regarding content was about the theme of light and diet foods, which, according to the evaluators, should be better explained in the card. After discussion among the researchers, it was decided to remove the card from the game, as it is a complex subject for an educational game, as suggested by the experts.

The second card from the food domain brought the alert to industrialized seasonings and contained the illustration of natural seasonings, with evaluators suggesting replacing only the figure with sachets of ready-made seasonings. Finally, the third card covered good practices at meal times and it was suggested that there be an illustration of people gathered having a meal.

All physical activity and tobacco and alcohol use domain charts reached the minimum CVR value required to be validated. However, as suggested by experts, the incentive to practice Tai Chi Chuan was removed from card number 10 of the physical activity domain, leaving only dance as a suggestion, considering the socioeconomic profile of SUS users. Also, according to experts' suggestions, in one of the cards of the tobacco and alcohol use domain, it was decided to include the Reference Center for Alcohol, Tobacco and Other Drugs (CRATOD - *Centro de Referência de* Álcool*, Tabaco e Outras Drogas*) as one of the primary care services that can promote and assist in smoking cessation.

After reformulating the title and appearance of the game and the three cards of the food domain, they were sent to the 14 evaluators for a new opinion. In this round, all reassessed items exceeded the critical cutoff point of CVR and were considered valid by experts, as shown in Tables 2 and 3.

Table 3 lists the final CVR means for each game domain, and the final version of the game cards can be seen in Supplementary Material 1.

Table 3 - Mean CVR of assessment rounds and final mean CVR for each game domain in relation to indicators assessed by experts. São Paulo, 2022.

	Healthy eating		Physical exercises	Smoking and alcohol	Final mean
	1st round	2nd round	1st round	1st round	
Clarity	0.85	0.88	0.90	0.92	0.90
Theoretical relevance	0.85	0.87	0.95	0.97	0.93
Practical relevance	0.85	0.90	0.95	0.97	0.94
Image visibility	0.97	0.97	0.98	0.98	0.98
Font visibility	0.99	0.99	1	0.99	0.99
Relation of the text to the figure	0.87	0.87	0.96	0.97	0.93

DISCUSSION

Cardiovascular prevention programs aim to reduce CVD morbidity and mortality and the socioeconomic burden generated by treatment costs and loss of individual productivity. For this to occur, patients and their families must have adequate self-care knowledge and skills[3,14–19]. However, the knowledge of patients with CAD about secondary prevention is inadequate, and information source reliability is weak[15]. This study sought to develop and validate a tool that can be used as an educational intervention in the context of cardiovascular prevention, based on guidance on the importance of changing lifestyle habits that are closely related to CAD progression, such as obesity, sedentary lifestyle and smoking.

The literature points to a lack of knowledge about cardiovascular prevention. In this light, the guidelines on cardiovascular prevention emphasize the incorporation of a healthy lifestyle and habits as a goal for a healthy life [3,14–21]. For this reason, the subjects of healthy eating, physical activity and tobacco and alcohol use were selected, *a priori*, in the game developed in this study, since changing such habits have a positive impact on morbidity and mortality from CVD[14,15]. However, many other issues can and should be addressed in health education for patients with CVD, such as mental health, socioeconomic aspects, medication adherence and symptom recognition[3,14–19, 24].

Studies using board games have found a reduction in depression in institutionalized older adults[25], improvement in cognitive ability in patients with Alzheimer's disease[26], healthy eating promotion, smoking cessation and safer sex[18]. Specifically in the area of cardiology, a randomized clinical trial conducted in Thailand found that a board game was associated with improved knowledge and self-care behavior in patients with heart failure up to three months after the game session[27].

The content addressed in the board game is in line with all guidelines recommendations for CVD prevention, i.e., guidelines were addressed on the need to choose foods with less fat; the need to avoid ultra-processed foods, due to the greater risk of fat and sodium, which could lead to increased blood pressure levels; encouraging the consumption of foods such as fruits, vegetables and greens; the frequency of up to 3 hours for food consumption; some recommended practices during food preparation, such as preference for grilling or baking food and removing visible fat before preparation. Some guidelines were also included regarding eating routine, mainly in relation to maintaining meal times, the need for complete chewing of food and avoiding distractions during meals [3,14–17,21].

With regard to physical activity, the recommendations are consistent with those published by the World Health Organization (WHO) regarding the frequency for moderate (150 minutes/week) and vigorous (75 minutes/week) physical activity; the benefits of physical activity for mental health

and the cardiovascular system; the need for stretching and the time to perform it before and after the exercises, with a view to reducing the risk of muscle injuries; the importance of hydration during physical exercises and a balanced diet; and on clothing that aims to improve comfort and safety in physical activity[3,14–19].

The smoking and alcohol domain is another extremely important topic in health education for CVD prevention, mainly because these lifestyle habits tend to substantially increase arterial stiffness, increased lipid levels and atherosclerosis progression. Therefore, the benefits of interrupting smoking habits were included in the cards, especially drug treatments and nicotine replacement therapies aimed at controlling tobacco dependency and the places made available by SUS to monitor these dependencies [3,14–19].

Before applying the board game aiming at health education, attention should be paid to the phase that precedes its application, i.e., content validity evidence analysis in relation to clarity (whether the information is clear regardless of the educational stratum), practical relevance (if they were really important in relation to the main construct of the game) and theoretical relevance (if the cards in the game were related to the proposed construct/aspect). In addition to the indicators in relation to the game's content, this study also assessed the game's general appearance (colors, font visibility and relationship between the text and the figure), aiming at greater patient enthusiasm during the game and that the images would bring a complement to the cards' textual information[12–13].

It is recommended that this analysis should be carried out by a group of experts with a high level of training in the specialty and clinical experience, which is consistent with the profile of the experts involved in this study, since the group of experts were mostly professionals with *stricto sensu* graduate degree, with clinical experience in cardiology, working in the care and research areas[12–13].

After validity with experts, the game must be submitted to validity evidence analysis by the target population so that studies that assess the effect of the board game in modifying lifestyle can be carried out, identified here as a study limitation.

CONCLUSION

The board game "*Desafio Educa-cor*" was developed with the main themes related to healthy lifestyle habits and obtained satisfactory content and face validity evidence after assessment by a heterogeneous group of experts. Such an instrument can be used as a resource for health education of patients with CAD and also for future research, both in relation to clinical validity and the consequences of the test in the game's target population.

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NOTES

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CONFLICT OF INTEREST

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SUPPLEMENTARY MATERIAL

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