DEVELOPMENT AND RELIABILITY OF AN INSTRUMENT TO MEASURE PSYCHOSOCIAL DETERMINANTS OF SALT CONSUMPTION AMONG HYPERTENSIVE PATIENTS[1]

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This study aimed to present the content validity and reliability analyses of an instrument to study the determinant factors of salt consumption among hypertensive subjects, based on an extension of the Theory of Planned Behavior. Content validity was assessed by 3 experts and a pre-test was carried out with 5 subjects. The final tool, comprising 3 different behaviors related to salt consumption and corresponding psychosocial variables, was applied to 32 subjects for internal consistency and temporal stability (15-day interval) analysis. Cronbach's alpha coefficients > 0.70 and significant intra-class correlation coefficients were observed for most variables, indicating the temporal stability of the measured concepts. The developed instrument exhibited evidence of both content validity and reliability.

DESCRIPTORS: diet, sodium-restricted; reproducibility of results; nursing

DESARROLLO Y CONFIABILIDAD DE UN INSTRUMENTO PARA MEDIR LOS FACTORES PSICOSOCIALES DETERMINANTES EN EL CONSUMO DE SAL ENTRE HIPERTENSOS

Este estudio tuvo como objetivo presentar el análisis de validez de contenido y de confiabilidad de un instrumento para estudiar los factores determinantes del consumo de sodio entre hipertensos, basado en la extensión de la Teoría del Comportamiento Planificado. El instrumento fue sometido a validez de contenido por 3 jueces y a una prueba piloto con 5 sujetos. El instrumento final, compuesto por 3 comportamientos relacionados al consumo de la sal y por las variables psicosociales correspondientes, fue aplicado a 32 sujetos para evaluación de la consistencia interna y de la estabilidad temporal (intervalo de 15 días). Fueron observados coeficientes alfa de Cronbach>0,70 para la mayoría de las variables y coeficientes de correlación entra clases significativas, que apuntaron la estabilidad temporal de los conceptos mensurados. El instrumento desarrollado mostró evidencias de validez de contenido y de confiabilidad.

DESCRIPTORES: dieta hiposódica; reproducibilidad de resultados; enfermería

DESENVOLVIMENTO E CONFIABILIDADE DE INSTRUMENTO PARA MENSURAÇÃO DOS FATORES PSICOSSOCIAIS DETERMINANTES DO CONSUMO DE SAL ENTRE HIPERTENSOS

Este estudo teve como objetivo apresentar a análise da validade de conteúdo e da confiabilidade de um instrumento para estudo dos fatores determinantes do consumo de sódio entre hipertensos, baseado na extensão da Teoria do Comportamento Planejado. O instrumento foi submetido à validade de conteúdo por 3 juízes e pré-teste com 5 sujeitos. O instrumento final, composto por 3 comportamentos relacionados ao consumo de sal e pelas variáveis psicossociais correspondentes, foi aplicado a 32 sujeitos para avaliação da consistência interna e da estabilidade temporal (intervalo de 15 dias). Foram observados coeficientes alfa de Cronbach>0,70 para a maioria das variáveis e coeficientes de correlação intraclasse significativos, apontando para a estabilidade temporal dos conceitos mensurados. O instrumento desenvolvido mostrou evidências de validade de conteúdo e de confiabilidade.

DESCRITORES: dieta hipossódica; reprodutibilidade dos testes; enfermagem

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INTRODUCTION

Changes in food patterns, with less vegetable consumption, increased use of meet and, recently, industrialized products[1], have resulted in salt intake above recommended limits in different population groups[2-3]. A recent study[3] found daily salt consumption between 13 and 17g in hypertensive patients, with 40 to 55% of this consumption deriving from addition to foods during or after their preparation, while consumption of high-salt foods was also frequent. This intake greatly exceeds the recommended limit of 6g of salt/day for normotensive people or 4g of salt/day for hypertensive persons[4].

Excessive salt consumption, in turn, has been associated with severity of arterial hypertension and ventricular hypertrophy[5], resulting in international recommendations for the use of reduced-salt diets as an important non-pharmacological intervention in hypertension prevention and treatment[6]. Hypertensive patients are familiar with recommendations about the need to restrict salt consumption in their diet. Many report following low-salt diets, as appointed in earlier research[7-8]. The actual measurement of this behavior, however, indicates continued high consumption in that population, which confirms that food pattern changes are not easy to achieve and maintain. There is growing evidence that education programs have the highest chance of success if they are aimed at factors that operate on the motivation to act[9].

In social psychology, there are conceptual models that serve as a base to understand and to predict health behaviors. In general, strong variations are found between subjects who adhere or not to certain behaviors, particularly in terms of cognitive factors, described as the most important determinants of the motivation to act and, consequently, of behavior[10]. Among theories aimed at understanding and predicting health behaviors, the Theory of Planned Behavior[11] – TPB has been widely used, including for food-related behaviors[12-13]. According to TPB, the proximal determinant of volitional behavior is one's intention to engage in that behavior. Intention is determined by three variables: the attitude related to the behavior, subjective norms and perceived behavioral control (PBC)[11]. Further, for the behaviors that are not completely volitionally controlled, the TPB incorporates perceptions of control over performance of the behavior as an additional behavior predictor. The key idea of the model can be expressed by the equation: $B \approx I (+PBC) \approx A + SN + PBC$ (where: B = behavior; I = intention; A = attitude; SN = subjective norm; PBC = perceived behavioral control).

The application of these motivational theories requires the use of instruments based on psychometric scales aimed at measuring the magnitude of factors related to the behavior under analysis and its correlations and, like any other instrument for measurement of psychosocial variables, need to demonstrate evidence of psychometric properties, such as reliability and validity[14].

Despite recommendations to restrict dietary sodium consumption and the observation that high salt consumption is frequent in different populations, no scientifically solid instruments were available in Brazilian and international literature which intend to assess determinant factors of sodium consumption behavior. Hence, this study aimed to present the content validity and reliability analysis of an instrument to study the determinants of sodium consumption behavior among hypertensive patients, based on an extension of the TPB model.

METHOD

Instrument development

The instrument was designed after an extensive literature review of research that used sociocognitive theories to study food behaviors and specific studies on factors interfering in salt consumption. TPB was used as the theoretical framework, in addition to other variables related to food behavior (self-efficacy, habit and environment) or specifically to salt consumption (food preferences, hedonic determinants and diet quality assessment). Direct measurements of the involved constructs were carried out[11].

Definition of psychosocial variables

Behavior was initially defined as: consider a low-salt diet as: consumption in the last 2 months of

a diet: - *With no addition of salt in the food preparation; No use of table salt and - Not eat foods with high sodium content (snacks, industrialized foods, cold cuts, salted meats and others) - the use of less than 4g of salt (corresponding to 1 "flat" teaspoon of salt) when cooking one of your usual recipes for any meal ; - To avoid adding table salt to the food you eat at meals (or snacks); and also, - to avoid the consumption of food with high salt content (i.e., snacks, industrialized foods, salty spices, etc…)*, according to the following elements: action, target, context and time[11]. Starting from the behavior, assertions were formulated to measure intention and its determinants.

Content validity

The first version of the instrument was submitted to three judges with expertise on health behavior research and experience in measurement instrument validation, who assessed conceptual adequacy and clarity of the items. This version was applied to five subjects with characteristics similar to the target population, in order to identify words or questions that were difficult to understand or misunderstood[15]. Little understanding on the generic issue of sodium consumption was verified among subjects who did not prepare their own meals. Moreover, a new discussion with the judges revealed that, as sodium consumption is a behavioral category with different actions[16], it could not be defined by one single question, so that the behavior was divided into three distinct actions, as follows.

Behavior 1 – *the use of less than 4g of salt (corresponding to 1 "flat" teaspoon of salt) when cooking one of your usual recipes for any meal;* Behavior 2 - *To avoid adding table salt to the food you eat at meals (or the snacks)* and Behavior 3 – *to avoid the consumption of food with high salt content (i.e., snacks, industrialized foods, salty spices, etc…).*

Another recommendation from the judges was to investigate behavior 1 among subjects who prepared their own meal only, as it would not be coherent to investigate determinants of behaviors the subject does not perform. As a small number of male patients prepare their meals, the recommendation was to restrict the investigation of behavior 1 to female patients, who are responsible for preparing meals.

Some items in the habit variable were modified. One item considered redundant (*I do not need to think in order to do it*) was withdrawn and phrases formulated with "no" (e.g.: *I feel weird if I don't do it*) were reformulated for the sake of easier understanding. The final instrument was pretested again, involving five subjects from the target population, revealing that the understanding of behaviors and related variables had improved considerably, with no need for additional modifications.

Instrument

The instrument consisted of three behaviors related to salt consumption and their respective psychosocial variables: intention, attitude, subjective norm, perceived behavioral control, self-efficacy and habit (the latter for behaviors 1 and 2 only) as well as general variables, taken from other models or described as salt consumption-related.

Behavior – The three behaviors were measured through the following question: *in the last 2 months, which alternative best describes your behavior of* [description of behaviors 1, 2 or 3] *(1) all days of the weeks, (2) most days of the week, (3) sometimes, (4) rarely, (5) never.* To calculate the final score, answer scores are inverted to maintain uniformity in the interpretation of scores (the higher the score, the more favorable to the behavior).

Intention - intention was measured by six items on five-point Likert scales for each behavior, (e.g.: *I intend to* [description of behavior] *in the next 2 months* definitely not[1] – definitely [5]).

Attitude - Attitude was measured using five-point bipolar adjective scales to answer one single question for each behavior (e.g.: *for me* [behavior description] *in the next 2 months is:* bad [1] – good [5], harmful [1] – beneficial [5], unpleasant [1] – enjoyable [5], boring [1] – pleasant [5], silly [1] – wise [5]).

Subjective norm – The subjective norm was assessed by four questions on five-point Likert scales (e.g.: *people important to me think that I:* definitely should not [1] – definitely should [5] [behavior description] *in the next 2 months*).

Perceived behavioral control – The perception of behavioral control was measured by four questions on five-point Likert scales, for each behavior, (e.g.:

the decision to [behavior description] *in the next 2 months depends on me only:* I completely disagree [1] – I completely agree [5]).

Self-efficacy – Self-efficacy was measured by three items, on a five-point Likert scale (e.g.: *I trust in my ability to* [behavior description] I completely disagree [1] – I completely agree [5]).

Habit – Habit was measured by 10 items for behaviors 1 and 2 only, that is, the habit of adding more than 4 grams of salt during and after meal preparations, and also using the saltshaker on the table. Answer options were displayed on a five-point Likert scale (e.g.: [adding more than 4 grams of salt when preparing foods] *is something I do frequently:* I completely disagree [1] – I completely agree [5]).

Food preferences –food preferences were assessed by two questions on a five-point Likert scale (e.g.: *in general, I prefer foods that are:* 1-salty, 2 – sweet, 3 - bitter, 4 – sour, 5 – no preference).

Hedonic determinants – Related to the pleasure of eating and the palate, hedonic determinants were measured by two items, on a five-point scale (e.g.: *for me, low-salt foods are:* very bland [1] – very tasteful [5]).

Self-assessed diet quality – Diet assessment was measured by one single item, on a five-point scale (*considering your treatment for high blood pressure, how do you assess your food in terms of salt consumption?* [1] very bad – [5] very good).

Environment – The environment refers to the subjects' access to high and low-salt foods. It was measured by means of two items on a five-point Likert scale (e.g.: *in general, do you think you can easily get low-salt foods?* I completely disagree [1] – I completely agree [5]).

Reliability assessment – The final version of the instrument was applied to 32 subjects for reliability analysis, according to homogeneity (internal consistency), using Cronbach's alpha and the stability criterion, with the test-retest. Alpha coefficients above 0.70 were considered indicators of high consistency[17]. Fifteen days after the initial application, the instrument was again applied to the same 32 subjects to verify agreement between answers at both times, analyzing the intra-class correlation coefficient (ICC) and the weighted Kappa coefficient for one item in the food preferences, a nominal variable.

Ethical aspects – The project and the free and informed consent term, which participants signed before the interview, were approved by the local Research Ethics Committee (CEP No 563/2006).

RESULTS

Study participants in this phase were 32 hypertensive patients with a mean age of 55.13 (±7.86) years, 50% of whom were women, 53.1% married, with an average 7.2 (±3.62) years of education, and 14.7 (±11.6) years as the mean length of hypertension diagnosis.

Internal consistency

Table 1 shows the mean total and item scores, as well as Cronbach's alpha coefficients for each construct related to the three behaviors. Scores for most variables were above 4.0 for the three behaviors, suggesting that the study group is favorable to a low-salt diet. One exception was habit (behaviors 1 and 2), a variable that obtained lower mean scores than the other variables, suggesting that participants were accustomed to automatically add salts when preparing or to already prepared foods, without thinking about it.

In the reliability analysis, most variables for behaviors 1, 2 and 3 reached Cronbach's alpha coefficients above 0.70, except for subject norm, which scored between 0.58 and 0.67. For the three behaviors, removing item four of the subjective norm resulted in a substantially better coefficient.

Stability (test-retest)

Table 2 presents ICC values for each psychosocial variable related to the three behaviors and for the additional general variables, as well as the Kappa coefficient for the nominal variable. ICC for variables of behaviors 1 and 2 were >0.44, indicating temporal stability. In both behaviors, the intention construct revealed a trend towards temporal stability.

In behavior 3, all variables presented significant coefficients, indicating temporal stability, which was also observed for the general questions, with ICC levels of more than 0.45 and a weighted Kappa coefficient of 0.64.

Table 1 - Mean, standard deviation and Cronbach's alpha of variables related to the three behaviors

Variable	Behavior 1 (n=16)			Behavior 2 (n=30)			Behavior 3 (n=30)		
	Mean (sd)	Cronbach's Alpha	Cronbach's Alpha (if item was deleted)	Mean (sd)	Cronbach's Alpha	Cronbach's Alpha (if item was deleted)	Mean (sd)	Cronbach's Alpha	Cronbach's Alpha (if item was deleted)
Intenção (Intention)									
Eu tenho intenção de (I intend to...)	4.19 (1.11)			4.83 (0.38)			4.17(0.70)		
Estou planejando (I am planning to...)	4.44 (0.51)			4.67 (0.48)			4.10 (0.84)		
Eu vou tentar (I will try...)	4.31 (0.48)			4.73 (0.45)			4.23 (0.68)		
Eu quero (I want...)	4.31 (0.79)			4.73 (0.45)			4.30 (0.65)		
Eu espero (I hope...)	4.38 (0.50)			4.70 (0.47)			4.30 (0.53)		
Qual a probabilidade (What is the probability...)	4.25 (0.77)			4.80 (0.41)			4.30 (0.79)		
Escore total (Total score)	4.31 (0.51)	0.82		4.74 (0.34)	0.87		4.23 (0.54)	0.87	
Atitude: para mim,… é:"(Attitude: "for me,... is:")									
Ruim/bom (Bad/good)	3.94 (1.12)			4.73 (0.58)			4.37 (0.85)		
Prejudicial/benéfico (Harmful/beneficial)	4.69 (0.48)			4.90 (0.40)			4.57 (0.57)		
Desagradável/agradável (Unpleasant/enjoyable)	3.88 (0.96)			4.47 (0.82)			4.10 (1.03)		
Chato/prazeroso (Boring/pleasant)	3.75 (0.93)			4.47 (1.01)			4.07 (0.91)		
Bobagem/sensato (Silly/wise)	4.38 (0.50)		0.64	4.67 (0.48)			4.43 (0.57)		
Escore total (Total score)	4.13 (0.54)	0.58		4.65 (0.53)	0.83		4.31 (0.60)	0.82	
Norma subjetiva: pessoas importantes para mim (Subjective norm: people important to me)									
Acham que devo/não devo...(They think I should/I should not)	4.44 (0.81)			4.80 (0.41)			4.60 (0.56)		
Desaprovam/aprovam... (They disapprove/approve)	4.19 (0.98)			4.47 (0.51)			4.67 (0.48)		
Querem que eu... (They want me to…)	4.50 (0.82)			4.77 (0.43)			4.53 (0.57)		
Sinto pressão social para... (I feel social pressure to…)	3.44 (1.55)		0.93	3.07 (1.66)		0.67	3.20 (1.45)		0.83
Escore total (Total score)	4.14 (0.67)	0.67		4.28 (0.52)	0.58		4.25 (0.51)	0.66	
Controle comportamental percebido (perceived behavioral control)									
...depende só de mim (…depends on me only)	4.31 (1.08)			4.53 (0.82)			4.37 (0.93)		
Quanto controle você tem... (How much control have you got…)	4.63 (0.62)		0.66	4.90 (0.31)			4.67 (0.48)		0.62
Tenho certeza que poderia... (I'm sure I could…)	4.38 (0.50)			4.83 (0.38)			4.33 (0.84)		
Difícil/fácil... (Hard/easy…)	3.88 (0.81)			4.67 (0.48)			3.97 (1)		
Escore total (Total score)	4.30 (0.49)	0.53		4.73 (0.36)	0.70		4.33 (0.53)	0.46	
Autoeficácia (self-efficacy)									
Confio na minha capacidade... (I trust in my ability to…)	4.31 (0.87)			4.80 (0.41)			4.57 (0.68)		
Sou capaz de... (I am capable of …)	4.38 (0.81)			4.80 (0.41)			4.53 (0.51)		
Tenho certeza que sou capaz... (I am sure I am capable of…)	4.38 (0.81)			4.73 (0.45)			4.50 (0.63)		
Escore total (Total score)	4.35 (0.80)	0.97		4.78 (0.33)	0.70		4.53 (0.52)	0.83	
Hábito: usar mais que 4 gramas de sal (Habit: using more than 4 grams of salt)									
...faço frequentemente (…I do that frequently)	3.06 (1.18)			1.27 (0.45)					
...faço automaticamente (…I do that automatically)	3.19 (1.47)			1.30 (0.47)					
...faço sem ter que lembrar... (…I do that without needing to remember…)	2.81 (1.17)			1.33 (0.48)					
...se não fizer sinto-me estranho (…if I don't do that I feel weird)	2.81 (1.28)			1.33 (0.55)					
...faço sem pensar (…I do that without thinking)	2.88 (1.36)			1.33 (0.48)					
...esforço para não fazer (…effort not to do that)	2.44 (1.31)			1.67 (1.12)					
...faz parte do dia a dia (…it's part of my daily life)	3.06 (1.18)			1.37 (0.49)					
...começo fazer sem perceber (…I start doing that without even noticing)	2.44 (1.03)			1.30 (0.65)					
...difícil não fazer (…it's hard not to)	2.06 (0.85)			1.53 (0.94)					
...acostumado fazer... (…used to doing…)	3.31 (1.14)			1.30 (0.47)					
Escore total (Total score)	2.81 (0.93)	0.93		1.37 (0.46)	0.92				

Table 2 – Mean scores of variables on test and retest and temporal stability analysis of behavioral variables 1, 2 and 3 and general questions

Psychosocial variables	Mean (sd) - test	Mean (sd) - retest	ICC	P-value
Behavior 1				
Intention	4.31 (0.51)	4.48 (0.42)	0.37	0.071
Attitude	4.13 (0.54)	4.31 (0.56)	0.53	0.013
Subjective norm	4.14 (0.67)	4.09 (0.51)	0.48	0.026
Perceived behavioral control	4.30 (0.49)	4.38 (0.61)	0.70	0.001
Self-efficacy	4.35 (0.80)	4.50 (0.56)	0.64	0.003
Habit	2.81 (0.93)	2.33 (0.94)	0.65	0.002
Behavior 2				
Intention	4.74 (0.34)	4.76 (0.34)	0.29	0.056
Attitude	4.65 (0.53)	4.71 (0.46)	0.45	0.005
Subjective norm	4.28 (0.52)	4.33 (0.51)	0.59	<0.001
Perceived behavioral control	4.73 (0.36)	4.76 (0.37)	0.71	<0.001
Self-efficacy	4.78 (0.33)	4.77 (0.41)	0.66	<0.001
Habit	1.37 (0.46)	1.29 (0.36)	0.46	0.004
Behavior 3				
Intention	4.23 (0.54)	4.43 (0.48)	0.53	0.001
Attitude	4.31 (0.60)	4.45 (0.55)	0.40	0.013
Subjective norm	4.25 (0.51)	4.18 (0.52)	0.57	<0.001
Perceived behavioral control	4.33 (0.53)	4.40 (0.56)	0.39	0.015
Self-efficacy	4.53 (0.52)	4.43 (0.53)	0.39	0.014
General questions				
Food preferences				
Salty/sweet/bitter/sour*	2.50(1.66)	2.50(1.63)	0.64	<0.001
No salt/low salt/salt/high salt	2.27(0.64)	2.40(0.56)	0.46	0.005
Hedonic determinants				
Foods: low salt/bland/tasteful	3.40(1.22)	3.70(0.95)	0.59	<0.001
Salty foods: bland/tasteful	2.67(1.42)	2.80(1.40)	0.50	0.002
Diet quality	4.23 (0.68)	4.37 (0.67)	0.49	0.003
Environment				
Easy access to low-salt foods	4.07 (0.98)	4.07 (0.98)	0.46	0.004
Easy access salty foods	2.97 (1.43)	2.40 (1.38)	0.51	0.002

*Weighted Kappa

DISCUSSION

This study aimed to test the psychometric properties of an instrument that was developed to study the determinants of sodium intake among hypertensive patients. The content validity phase indicated that salt consumption should be assessed not merely from the perspective of one single behavior, but according to three distinct behaviors that result in final dietary salt consumption. Sodium is present in foods *in natura*, in the salt added when preparing meals, in the saltshaker used on the table and, in high concentrations, in industrialized foods[18]. This particular characteristic of sodium consumption entails additional complications, also to estimate consumption in quantitative terms[3].

In general, the data also evidence that the measures of the psychosocial variables that constitute the intention to perform the three behaviors, as well as the intention measure, are reliable according to the criteria of homogeneity and stability. For some of them, certain considerations are due about their psychometric performance. In the three behaviors, a low item-total correlation was observed for item 4 of the subjective norm, *I feel social pressure to* [behavior 1, 2 or 3], indicating that, although conceptually adequate, the patients did not interpret it consistently with the other items in the construct. Hence, in subsequent study phases, the deletion of this item must be considered when assessing subjective norm for the three behaviors.

As for temporal stability, all concepts measured revealed stability in the examined interval, which is important for future research aimed at analyzing the natural evolution of these perceptions, or at assessing the effects of educative interventions to modify them[12].

The development of scales to measure factors that support salt consumption behavior, mainly in hypertensive patients, who significantly benefit from the adoption of a low-salt diet, entails different consequences for nurses' educative practices. Reliable and valid measures are necessary to allow nurses to design and assess orientation programs based on social and behavioral theories[10], with greater chances of success.

Before using this instrument, however, salt consumption needs to be diagnosed: its quantification, followed by the identification of sources contributing to excessive consumption, like in earlier studies[3]. The next step is to diagnose the psychosocial determinants of each behavior. Although these behaviors are complementary, factors supporting their practice can differ. Hence, each behavior can require a specific intervention on its determinant factors. Therefore, the identification of what factors motivated a person to adopt a low-salt diet or not provides support to guide the elaboration and practice of interventions[10]. Besides, predictive factors can differ depending on populations or population subgroups.

In this sense, it is expected that applying scales is useful to detect such differences, guide specific interventions and, also, to serve as a reference to assess the efficacy of interventions put in practice in different population subgroups[19].

In conclusion, data obtained in this study provided support for content validity and reliability according to internal consistency and stability criteria of the instrument to measure determinants of sodium consumption among hypertensive patients, given their behaviors of adding salt while preparing their meals, adding salt to prepared foods and consuming high-salt foods. This instrument is expected to be a useful diagnostic tool for health education intervention.

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