Psychometric properties of the Romanian version of Champion’s Health Belief Model Scale for breast self-examination

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Abstract
This study set out to translate Champion’s Health Belief Model Scale and to test its properties on a Romanian sample. The study included 502 participants. The structural validity, convergent validity, criterion validity and reliability were evaluated for the Romanian version. The exploratory factor analysis highlighted six factors. The confirmatory factor analysis upheld the correctness of the six-subscale model as presenting a good fit for the 34-item version. Convergent validity was supported by the fact that the constructs included in the model correlated significantly with similar constructs evaluated using other questionnaires. In terms of criterion validity, those women who perceived fewer barriers and more cues to action and had greater self-efficacy practiced more frequent breast self-examination. α Cronbach coefficients ranged between .74 and .87 and test-retest correlation coefficients for the six subscales fell between .47 and .69. The Romanian version of the Champion Health Belief Model Scale is valid and reliable tool.

Keywords Cancer · Breast self-examination · Champion Health Belief Model Scale

Introduction
According to the World Health Organization (WHO), cancer is the second most common cause of death worldwide, accounting for 9.6 million deaths in 2018. Of the various types of cancer, that most often encountered in women is breast cancer, followed by colo-rectal, lung, cervical, and thyroid cancers (WHO, 2021a). As breast cancer progresses, it has a major impact both on patients themselves and on their families: both the sufferers themselves and their family members find themselves facing negative consequences at both physical and psychological levels (Grunfeld et al., 2004; Glajčen, 2012; Campbell-Enns & Woodgate, 2015; Vintilă et al., 2019; Ştefănuţ et al., 2020; Ştefănuţ et al., 2021). Consequences of breast cancer, breast surgery, partial or complete removal of the breast often leads to higher breast awareness, appearance dissatisfaction and lowering of the level of psychological well-being (Swami et al., 2020).

The WHO has drawn attention to the fact that between 30% and 50% of deaths caused by cancer could be prevented by the avoiding of risk factors and by the implementation of evidence-based intervention strategies, while the burden of suffering inflicted by this disease could be reduced by early detection (WHO, 2021b). Thus, according to WHO, risk factors that should be avoided are tobacco use, alcohol consumption, excessive weight gain, diet low in fruits and vegetables, lack of exercise, exposure to ultraviolet radiation, exposure to pollution, unprotected sex. Also, intervention strategies designed to promote the avoidance of these risk factors should be based on the best available scientific evidence, apply programme-planning frameworks, involve the community in decision-making, include robust evaluations of outcomes and contribute to their dissemination (Brownson et al., 2009). Since there are no specific methods for breast cancer prevention, early detection becomes even more important. This includes screening, which aims to identify asymptomatic persons who have cancer or pre-cancer abnormalities, and early diagnosis, which aims to identify symptomatic persons at an early stage. Screening and early diagnosis are associated with reduced mortality rates and increased chances of survival. Thus, screening programmes have shown a reduction in mortality in different percentages: 16% (Arrospide et al., 2015), 19% (Pace & Keating, 2014), 20% (Marmot et al., 2013). Regarding early diagnosis, Howlader et al. (2018) found that 95% of patients diagnosed with
stage 1 disease survived 4 years after diagnosis regardless of the breast cancer subtypes and the American Cancer Society (2022) shows that the 5-year survival rate is 99% for women diagnosed with localized disease, 86% for those diagnosed with regional disease and 27% for those diagnosed with metastatic disease.

The screening methods that can be utilized in relation to breast cancer are self-examination, mammography, and clinical examination by medical professionals (Siu, 2016). Breast self-examination is a non-invasive procedure that costs nothing, takes only a little time, and does not involve seeking professional help, yet it has been shown that in spite of all these benefits it is little practised (Carelli et al., 2008; Karayurt et al., 2008; Akhtari-Zavare et al., 2015). An understanding of the factors that influence the adopting of this behavior has therefore become the focus of interest of research concerned with encouraging health-related attitudes. According to one of the best-known models (Brecker, 1984) attitude represents the evaluation of an object and includes affective, behavioral, and cognitive components. Beliefs are part of the cognitive component of attitudes and are the foundation for various theoretical models used in health-related attitude research, one of which is the frequently used Health Belief Model (HBM).

The HBM (Rosenstock, 1974) is a psycho-social model that was initially developed to explain a low level of adherence to tuberculosis screening and prevention programmes. It is based on cognitive theories (Lewin, 1951; Tolman, 1932) which consider that the adoption of a behavior depends on the subjective value that the person attributes to the outcome resulting from that behavior as well as on the expectation that performing it will lead to that outcome. According to these theories, in the case of health-related behaviors, people value avoiding illness and maintaining health and expect that performing certain actions will prevent illness. Thus, in the context of HBM, beliefs refer to a person’s estimates of their individual susceptibility to developing the disease and its severity as well as the likelihood of reducing its consequences through prevention and early diagnosis actions (Champion & Skinner, 2008).

The constructs initially included in the HBM are perception of susceptibility (the perceived probability of developing a given disease), perception of severity (the seriousness of the consequences of the disease), perception of benefits (the helpful effects of the proposed behaviors in reducing the chances of developing the disease or in reducing the negative consequences of having it), perception of barriers (obstacles that can appear in the way of adopting the proposed behaviors). Various early forms of the model also included the concept of cue to action (the internal or external stimulus needed to trigger the decision-making process to accept a recommended health action) (Hochbaum, 1958). In 1988 Rosenstock, Strecher, and Becker (Rosenstock et al., 1988) proposed that the construct of self-efficacy (a person’s confidence in their ability to successfully perform preventive behavior) should be added to the model. Thus, according to the HBM, the chances that a person will carry out breast self-examination increase in line with the strength of their belief that they are likely to develop breast cancer, that the consequences of that happening are serious, and that the suggested behavior will be effective in reducing the negative effects of the disease. A high level of confidence in self-ability- to carry out self-examination is likely to increase the probability that this behavior will be followed, while the existence of barriers such as embarrassment, fear or pain is likely to have a negative effect on the probability of their carrying out this self-examination.

Since its definition HBM has been used across the health continuum including disease prevention and sick-role behavior (Janz & Becker, 1984). Also, HBM has been used to explain the behaviors that were related to a number of chronic diseases such as diabetes (Wdowik et al., 2001), chronic obstructive pulmonary disease (Wang et al., 2014) and coronary heart disease (Ali, 2002). The review completed by Janz and Becker (1984) concluded that there is a substantial empirical support that claims that the dimensions of this model represent significant contributors able to explain and predict health-related behaviors. The meta-analysis conducted by Harrison et al. (1992) found that there is a significant positive relationship between HBM domains and the health-related behaviors. This framework facilitated the emergence of the researches that analysed the HBM model within the cancer-related context. Thus, Marmarà et al. (2017) found that self-efficacy, barrier perception and cue to action are significantly associated with breast cancer screening, while Darvishpour et al. (2018) also showed that self-efficacy, perceived benefits and barriers represent significant predictors for breast self-examination. Also, previous studies have demonstrated a significant association between the HBM constructs and this screening behavior (Ashton et al., 2001; Karayurt et al., 2008). The findings regarding the predictive nature of HBM components encouraged the implementation of the interventions based on this model. Thus HBM-based interventions have been shown to be effective in promoting self-examination as a method of early detection of breast cancer (Hajian et al., 2011; Tuzcu et al., 2016). Although the HBM is one of the most commonly used theoretical models in health behavior research, it also has limitations. One of the criticisms of HBM is that it only includes individual factors without considering the social context of the person as do other models such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975) or the Theory of Planned Behaviour (Ajzen, 1991) which take into account the influence that the approval of others can have on the adoption of behavior. Also, unlike these models, HBM does not give importance to the formation of behavioral
intention but only to the behavior itself. Another aspect of HBM that can be considered as a limitation refers to the fact that HBM does not highlight hierarchical or temporal links between cognitions as do Theory of Reasoned Action, Theory of Planned Behaviour or Protection Motivation Theory (Rogers, 1975). In addition, HBM considers behavioral change as a discrete event and not as the result of going through several stages as The Transtheoretical Model/ Stages of Change (DiClemente & Prochaska, 1982). Despite these criticisms the HBM has been a useful theoretical framework for health behavior research in recent decades. It includes constructs that are easy to understand and operationalise and has proven effective in numerous interventions aimed at behavioral change in various contexts including cancer.

In terms of operationalizing the HBM constructs, there are various questionnaires defined to assess breast self-examination behaviors such as those proposed by Stillman (1977), Calnan (1984) or Champion (1984). However, as far as the authors are aware, for the instruments developed prior to the one defined by Champion, there were no data on validity and reliability, Stillman’s questionnaire included only susceptibility and benefit variables and the concepts were only nominally operationalised. It was thus Champion who defined an instrument that included all the HBM constructs, which were measured by a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) and for which she checked both validity and reliability.

The purpose of Champion’s Health Belief Model Scale (CHBMS) was to identify the beliefs that influence breast self-examination from the perspective of the HBM. This instrument was devised in 1984 (Champion, 1984) and later revised (Champion, 1993). The instrument initially developed included 39 items and addressed the constructs of susceptibility (6 items), seriousness (12 items), benefits (5 items), barriers (8 items) and health motivation (8 items). The health motivation construct referred to the motivation, beliefs and behaviors associated with general health concerns. A convenience sample of 301 women participated in the study. Exploratory Factor Analysis (EFA) revealed seven factors, one each for the constructs susceptibility, benefits, barriers, motivation and three factors for the construct seriousness. The three factors associated with the seriousness construct were physical symptoms, long-term effects of breast cancer and financial or career problems suggesting that the seriousness scale may not be unidimensional. In terms of criterion validity, barriers and health motivation were significant predictors of breast self-examination behavior. Cronbach’s α coefficients ranged from .61 to .78 and test-retest coefficients were significant with values ranging from .47 to .86. The revised version of the questionnaire (Champion, 1993) included 42 items corresponding to the constructs susceptibility (5 items), seriousness (7 items), benefits (6 items), barriers (6 items), health motivation (7 items) and confidence (11 items). Confidence was added as a result of Rosenstock’s reconceptualization of the HBM incorporating the self-efficacy construct into the model. The study was conducted on a random sample of 581 women. The EFA revealed six factors as specified theoretically. All variables assessed by this version of the CHBMS were significant predictors of breast self-examination behavior. Cronbach’s α coefficients ranged from .80 to .93 and test-retest coefficients were significant with values ranging from .45 to .70. Subsequently CHBMS was translated and adapted for a variety of cultures (Lee et al., 2002; Karayurt et al., 2008; Dewi, 2018). For the Turkish version of the questionnaire (Karayurt et al., 2008), the revised version of the CHBMS was used. The EFA highlighted seven factors (susceptibility, seriousness, benefits, barriers1, barriers2, health motivation and trust) but two of them correlated at high level so that together they were considered to form the subscale barriers. In terms of criterion validity, all variables measured with this instrument were significant predictors of breast self-examination behavior. Cronbach’s α coefficients ranged from .58 to .89 and test-retest coefficients ranged from .45 to .70. The revised version of the CHBMS was also translated and validated for Korean culture (Lee et al., 2002). Eight factors (susceptibility, seriousness 1, seriousness 2, benefits, barriers, motivation 1, motivation 2, confidence) were obtained after applying the EFA. The factors related to seriousness correlated strongly with each other so that they were collapsed. As the correlation between the factors related to motivation was weak, only those items for which the reliability was greater than 0.7 were retained as items associated with motivation. Thus, this version of the CHBMS included 36 items structured in 6 factors as theoretically specified. For these factors, Cronbach’s α coefficients ranged from .72 to .92. The Indonesian version (Dewi, 2018) was developed from the original CHBMS. In order to obtain an instrument corresponding to the revised HBM, items corresponding to the constructs cues to action (8 items) and self-efficacy (3 items) were included and items corresponding to motivation were removed. Following the application of Confirmatory Factor Analysis (CFA) it was found that the fit indices were optimal for the six-factor model. Cronbach’s α coefficients ranged from .66 to .86.

In Romania, the incidence of breast cancer is 11.5%, with a mortality rate of 6.6% (WHO, 2021c). Given that over 33% of new cases in this country are diagnosed at stage IV (Tofan et al., 2018) (that is, in an advanced stage in which the disease has spread to other organs), encouraging screening with a view to early detection is a priority. Breast self-examination is a health behavior largely popularized that should be known and practiced monthly by all adult women (Champion, 1984). Research on monitoring breast self-examination is widespread among scientific community but there are no data regarding Romanian
population. Understanding the beliefs of women in Romania regarding self-examination as well as knowing the level of adherence to this behavior can help health professionals to create more effective educational programs in promoting this behavior. In order to monitor levels of adherence to breast self-examination, it is necessary to use an instrument that has been adapted to the Romanian population; however, to the best of the present authors’ knowledge no such questionnaire is currently available. That being the situation, the aim of this study is to translate the CHBMS for the Romanian population and to evaluate the psychometric properties of this version.

Thus, the research aims at structural validity, reliability, criterion validity and convergent validity. For structural validity, based on the literature, a six-factor structure of the questionnaire is considered. For reliability, internal consistency coefficients, test-retest correlations at 4-week intervals between applications and subscale item-total correlations are considered. For criterion validity we check whether the HBM constructs can predict self-examination behavior and for convergent validity we verify the association between the HBM constructs and similar constructs. Since no information was found in the literature on convergent validity for this instrument, were considered for the analysis constructs that by their definition are similar to the constructs included in the HBM:

Because susceptibility and severity express the perception of the threat of disease through the probability of contracting it but also through the negative consequences in different domains (physical, psychological, social, financial) they were considered conceptually close to health anxiety which is defined as excessive worry about developing a severe illness (American Psychiatric Association, 1994). Self-efficacy as a component of HBM expresses confidence in one’s ability to carry out the self-examination process and was considered to be similar to the concept of general self-efficacy defined by Bandura (1977) which refers to the perception of one’s ability to perform certain tasks and achieve certain goals.

In the context of HBM benefits express the perception of the ability of the recommended behaviors to reduce the risk of developing illness so it was considered similar to the perception of good health.

Due to the fact that cues to action refers to internal or external triggers that contribute to the decision to apply a recommended health behavior they were considered a similar concept to motivation which is responsible for orienting behaviors more towards one particular direction rather than others (Nuttin, 1955).

Barriers represent the possible internal or external obstacles whose perception may cause the person not to make the decision to adopt the recommended behavior, therefore it was considered a construct opposed to motivation.

Once such a tool is available to the Romanian population it can also be used by substituting a word or phrase for monitoring adherence to other recommended screening behaviors for breast cancer (e.g. mammography) or other cancers (e.g. colonoscopy) and for developing specific educational programmes to encourage them. As mentioned above, for HBM a possible hierarchical structure of the constructs was not analysed. The existence of this instrument may encourage Romanian research in this field and the study of such possible relationships between the HBM constructs and the targeted behaviors (e.g. it could be analysed whether self-efficacy mediates the effect of health beliefs on behavior).

We note that the structural validity as well as the reliability of this instrument have been frequently analysed but for criterion validity there is little information and convergent validity has not been studied. Through its objectives, this research can contribute to find new information on criterion validity and convergence, thus strengthening confidence in the psychometric qualities of this questionnaire.

Considering these gaps in the literature, the following research hypotheses have been formulated:

H1: The structure of the Romanian version of the CHBMS questionnaire includes six factors corresponding to the constructs susceptibility, severity, benefits, barriers, self-efficacy and cues to action.
H2: The Romanian version of the CHBMS questionnaire has a good reliability reflected by internal consistency coefficients higher than 0.7 and by significant test-retest correlations of high size effect.
H3: The constructs included in the HBM correlate statistically significantly with similar constructs.
H4: HBM predicts breast self-examination behavior.

Methods

Transparency and Openness

The data associated with the work are available in the OSF repository. Also, the syntax, the code used, and the tools described in this section are available on request. The study was not pre-registered.

Study Design

This research made use of a cross-sectional design.

Procedure

The research was carried out online in the months of November and December 2020 in the West University of Timișoara, Romania. Undergraduate students in the Faculty...
of Sociology and Psychology were informed about the opportunity to participate, along with their invitees. Participation was encouraged by the awarding of bonus points in the examinations. In order to be eligible, potential participants had to fulfil the following conditions: being female, knowing Romanian, being at least 18, and being capable of completing online questionnaires. Those who signed the consent form were given access to the questionnaires to be completed.

The study was carried out in two steps. The first involved translating the CHBMS into Romanian and evaluating psychometric properties of this new version on the Romanian population; the second was aimed at evaluating the reliability of the Romanian version using the test-retest method. To this end, a sub-sample of the women who had formed the initial sample were retested four weeks after the initial testing. This four-week time gap was chosen to comply with the recommendation that the interval between the two applications of the instrument should be between two and six weeks – long enough for participants not to remember the answers they gave the first time, but short enough to rule out variables having changed in the meantime (Tabachnick & Fidell, 2007).

This research has been approved by the Ethics Committee of West University of Timișoara.

Participants

As can be noticed from Table 1 the first stage of the study involved \( N = 502 \) women whose ages ranged from 18 to 70 (\( M = 24.91, SD = 9.99 \)). The second stage of the study involved 129 women aged between 18 and 52 (\( M = 22.6, SD = 7.36 \)) that constituted a sub-sample of the women who had formed the initial sample.

CHBMS Translation

The items used for Romanian version of Champion’s questionnaire were taken over from the Indonesian version of CHBMS (Dewi, 2018). This version had six subscales: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and perceived self-efficacy. Once the author of the instrument had given permission for it to be used and modified, the process of translating the scale began. The way it was translated from English to Romanian followed the procedure proposed by Beaton et al. (2000). In the first stage, two translators, one familiar with the instrument and the other not, made independent translations from English to Romanian of the items in the scale, the instructions, and the possible answers. In the second stage, a different translator studied the two versions of the translation, resolved discrepancies, and suggested a synthesis. Next, two more translators who did not know CHBMS translated the scale back from Romanian into English. In the fourth stage, all the translators who had been involved in the process, along with the authors of this article, examined the different versions of the translations (in Romanian and English). The fifth stage involved the pre-testing of the Romanian version of CHBMS on a sample of 20 women, who were asked to evaluate the intelligibility of the items on a 5-point Likert scale (from 1 = I don’t understand at all to 5 = I understand completely). Since all the items were judged to be thoroughly intelligible, no further modifications were made.

Variables and Instruments

The variables investigated in this study were the HBM constructs, breast self-examination behavior, general self-efficacy, health anxiety, general attitudes towards health, and demographic characteristics. HBM constructs were measured using the CHBMS, breast self-examination was assessed by a question proposed by the authors of the article and general self-efficacy was investigated by the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). Health anxiety was measured by the Health Anxiety Inventory (Salkovskis et al., 2002), general health attitudes were assessed by the Health Orientation Scale (Snell Jr. et al., 1991) and a questionnaire composed by the study authors was used for demographic characteristics.

Demographic Characteristics The items were designed to elicit the following information: age, relationship status, highest level of education completed, living environment, occupational status, general health, personal history of cancer, family history of cancer.

HBM Constructs The items used to evaluate HBM constructs were obtained as described in previous section. The questionnaire included six subscales corresponding to the HBM constructs: susceptibility, severity, benefits, barriers, self-efficacy, cues of action. Each item was rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The score for each scale was calculated by summing the scores given to the items that were part of that subscale.

Perceived susceptibility - refers to the person’s belief about the likelihood of developing breast cancer. Thus, the person may believe that they are part of a population at risk of developing this condition or they may believe that their characteristics predispose them to developing breast cancer. An example of an item targeting this construct is: “It is likely that I will get breast cancer”. The higher the scores obtained for this subscale, the higher the person’s perceived likelihood of having the disease in the future.
Perceived severity—refers to the belief about the severity of the disease but also the severity of its consequences in various domains. Medical consequences (disability, death) and possible social consequences (relationship with partner, work/education, financial stability) and psychological consequences (self-perception) were considered. One item included in this subscale was: “Breast cancer would threaten my relationship with my boyfriend/husband/partner”. Higher scores obtained for this subscale reflect a greater perception of the severity of the disease. Together susceptibility and severity represent the perceived threat of the disease.

Benefits - refers to the positive outcomes that the person believes can be achieved by applying the recommended behaviors. These benefits can be as diverse as increased chances of survival through early detection of the disease or reduced health anxiety through regular self-examination.

Barriers - refers to the negative aspects of applying breast self-examination. They can act as barriers to adopting the recommended behavior and may include financial costs, time costs, inconvenience, lack of support from significant others. Doing breast self-examination would take too much time “is an example of an item included in this subscale. Higher scores reflect more barriers perceived by the person in adopting this behavior.

Cues to action—represent events that may contribute to the decision to apply the self-examination behavior. These events can be internal (changes in the body) or external (doctor’s recommendation, media campaigns). An example of an item included in this subscale is: “I always fol-

| Table 1 Demographic characteristics | Stage 1 | Stage 2 |
|-------------------------------------|---------|---------|
| Number of participants             | 502     | 129     |
| Relationship status                |         |         |
| Single                             | 201 (40%) | 54 (41.9%) |
| In a relationship                  | 216 (43%) | 63 (48.8%) |
| Married                            | 74 (14.7%) | 9 (7%) |
| Separated or divorced              | 9 (1.8%) | 3 (2.3%) |
| Widowed                            | 2 (0.4%) | -       |
| Level of education                 |         |         |
| Middle school                      | 8 (1.6%) | -       |
| High school                        | 354 (70.5%) | 106 (82.2%) |
| First degree                       | 93 (18.5%) | 7 (5.4%) |
| Master’s                           | 45 (9%) | 15 (11.6%) |
| Doctorate                          | 2 (0.4%) | 1 (0.8%) |
| Environment                        |         |         |
| Urban                              | 367 (73%) | 94 (72.9%) |
| Rural                              | 135 (26.9%) | 35 (27.1%) |
| Occupational status                |         |         |
| Student                            | 378 (75.3%) | 112 (86.8%) |
| Employed                           | 91 (18.1%) | 11 (8.5%) |
| Business owner                     | 21 (4.2%) | 5 (3.9%) |
| Unemployed                         | 9 (1.8%) | 1 (0.8%) |
| Retired                            | 3 (0.6%) | -       |
| General health                     |         |         |
| Poor                               | 8 (1.6%) | -       |
| Good                               | 245 (48.8%) | 57 (44.2%) |
| Very good                          | 249 (49.6%) | 72 (55.8%) |
| Personal history of cancer         |         |         |
| No history of cancer               | 497 (99%) | 128 (99.2%) |
| History of breast cancer           | 1 (0.2%) y3 (0.6%) | - |
| History of other type of cancer    | -       | 1 (0.8%) |
| Family history of cancer           |         |         |
| No history of cancer               | 325 (64.7%) | 79 (61.2%) |
| History of breast cancer           | 51 (10.2%) | 15 (11.6%) |
| History of other type of cancer    | 126 (25.1%) | 35 (27.1%) |
low medical advice because it is beneficial for my own health”. Higher scores on this subscale are associated with perceiving more action triggers.

Self-efficacy - refers to the perception of personal competence to perform the recommended behavior and the ability to overcome various barriers. In the case of breast self-examination, it refers to the confidence that one can perform all the actions involved in the procedure (observation, palpation) and detect a lump. One item included in this subscale was: “I know how to perform breast self-examination”. A higher score for this subscale reflects better self-efficacy.

Breast self-examination behavior was evaluated by means of a question that referred to the frequency with which this behavior was carried out, with the following as possible responses: more than once a month/monthly/ once every 2 months/ once a year or less frequently/ never.

General self-efficacy was measured with the help of the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). This ten-item scale measures the degree to which someone is confident in their ability to react well in new and difficult situations. Responses to these items are evaluated on a 4-point Likert scale (1 = never, 4 = always). An example item on this scale would be “I can always manage to solve difficult problems if I try hard enough.”. The original version showed high levels of internal consistency with α Cronbach values, ranging from .82 to .93 for different samples. The α Cronbach value for the sample in this study was .91.

Health anxiety was measured using the 18-item version of the Health Anxiety Inventory (Salkovskis et al., 2002). This scale evaluates excessive worrying about health and the alarmist interpreting of various bodily sensations. An example item would be: I do not worry about my health/ I occasionally worry about my health/ I spend much of my time worrying about my health/ I spend most of my time worrying about my health. Items are scored from 0 to 3, with the total score being obtained by summing points. The internal consistency of the original version of this scale was .84, with the α Cronbach value for the sample in this study being .86.

General attitudes regarding health were evaluated using the Health Orientation Scale (Snell Jr. et al., 1991). This questionnaire has 10 subscales, each with 5 items, and covers the following aspects. The first subscale, personal health consciousness, measures the person’s tendency to think about their health and physical condition. The second, health image concern, measures what is defined as the tendency to be aware of the impression one’s own state of physical health is making on other people. The third subscale, health anxiety, highlights the level of anxiety and nervousness displayed in regard to one’s health. Health esteem-confidence has been defined as the person’s overall tendency to evaluate their health positively, while the motivation to avoid unhealthiness and motivation to healthiness scales are concerned with motivation to not be unhealthy and with motivation to preserve good physical health. Two other subscales, internal health control and external health control, measure a person’s tendency to believe that health is determined by factors that are (are not) under their own control. The health expectations subscale deals with the way a person evaluates their future health, while the final subscale, health status, throws light on the way the person assesses their physical condition. An example item from this questionnaire would be “I’m very motivated to be physically healthy”. All items are measured on a 5-point Likert scale (0 = not at all true of me, 5 = very characteristic of me). Scores for each subscale were calculated by summing points obtained for its items. α Cronbach values for the subscales of the original version ranged from .69 (external health control subscale) to .92 (health image concern subscale). For the sample in this study, α Cronbach values for the subscales used are: .60 for the health status subscale, .78 for the motivation to avoid unhealthiness subscale, .83 for the health anxiety subscale and .90 for the motivation for healthiness subscale.

Statistical Analysis

Statistical analysis was carried out using the SPSS v20 and R (R Core Team, 2014) programs. Given best-practice recommendations (Swami & Barron, 2019; Vintilă et al., 2020), we adopted an EFA and a CFA which allowed us to explore and then confirm the best-fitting model of HBM scores for our target population. The EFA was applied to the data collected from 251 of participants included in the first stage of the study and the CFA was applied to the data collected from the other 251 participants included also in the first stage of the research. In order to verify convergent validity, correlation coefficients were calculated between the HBM constructs (susceptibility, severity, benefits, cues to action and self-efficacy) and similar constructs measured using other scales (health anxiety, general self-efficacy and health orientation). Criterion validity was evaluated by assessing the degree to which the HBM constructs functioned as predictors of breast self-examination behavior. To this end, since breast self-examination behavior had been operationalized as the ordinal variable with possible values: “more than once a month”, “monthly”, “once every 2 months”, “once a year or less frequently”, “never”, multinomial logistical regression was employed. The criterion variable was frequency of
breast self-examination and the predictor variables were the HBM constructs. To establish reliability, α Cronbach coefficients, item – whole subscale correlation coefficients, and correlation coefficients between the HBM values obtained on the two successive applications were all calculated.

**Results**

**Demographic Characteristics**

The first stage of the study involved $N=502$ women. Of these, 57.7% were married or in an unofficial relationship. The majority of participants (70.5%) had finished high school as their highest level of education, 73% lived in the urban environment, and most said that they were healthy (48.8%) or very healthy (49.6%) and that they had no personal history of cancer and 61.2% had no history of cancer in their families. The great majority were students (82.2%), 72.9% lived in the urban environment, 55.8% regarded themselves as very healthy, 99.2% had no personal history of cancer (99%) and no history of cancer in their families (64.7%). The majority (75.3%) of the women in this stage of the study were students.

The second stage of the study involved $N=129$ women. The majority were married or in an unofficial relationship (55.8%). Most participants in this stage had finished high school (82.2%), 72.9% lived in the urban environment, 55.8% regarded themselves as very healthy, 99.2% had no personal history of cancer and 61.2% had no history of cancer in their families. The great majority were students (86.8%). The demographic data of the two samples are summarized in Table 1.

**Structural Validity**

**Exploratory Factor Analysis Results**

The Kaiser-Meyer-Olkin (KMO) test yielded a result of 0.85, demonstrating that the data were suitable for factor analysis. In addition, Bartlett’s Sphericity Test was statistically significant, indicating that the data are factorizable. Consequently, a principal axis factoring was applied to extract factors. In order to establish the optimal number of factors, we applied a parallel analysis (Horn, 1965; Sărăscu, 2012). This analysis compares the eigenvalues obtained for real data and the eigenvalues obtained for a random data set. Using for real data a principal axis factoring and Kaiser’s criterion resulted a solution with nine factors with eigenvalue greater than 1. Parallel analysis advises to retain a number of factors equal to the number of eigenvalues obtained for random data that are smaller than the eigenvalues obtained for real data set (Hayton et al., 2004). Applying this method, we obtained six factors for which these values are lower than the eigenvalue values obtained for real data. We continued applying exploratory factor analysis for the real data set by forcing six factors and using Oblimin rotation. We obtained that the 42 items loaded the six factors in a significant way, explaining 57.79% of the total variance. Twelve of the items referring to severity loaded in the first factor, accounting for 19.02% of the variance. Factor two accounted for 14.50% of the variance and was loaded by all the five items representing benefits. All six of the items describing susceptibility loaded in factor three, which accounted for 7.68% of the variance. Factor four accounted for 7.02% of the variance, with all the eight items representing barriers contributing. All the eight items linked with cues to action loaded factor five, accounting for 5.74% of the variance. Two of the items representing self-efficacy loaded in factor six, accounting for 3.80% of the variance. One of the items referring to self-efficacy loaded in factor three alongside the items referring to benefits (Table 2).

Table 3 shows the correlation matrix of the six subscales. It is to be noted that the correlations between the factors are below .40.

**Confirmatory Factor Analysis Results**

To verify the correctness of the factorial structure identified, confirmatory factor analysis was employed. For this, five models were compared. First, we tested the original form of the questionnaire with its 42 items, for which we considered three possible solutions: with one factor, with six non-correlated factors, and with six correlated factors. Then we excluded the problematic item (item 41) which was associated a priori with self-efficacy but which ultimately loaded in the benefits factor. Thus, what was tested was a model with 41 items and the six correlated factors. Analysis of error variance showed that seven item pairs were strongly correlated. Content analysis demonstrated that these are extremely similar items and after debating each situation, following reaching a consensus we removed one of the items that formed each of these pairs, as recommended in other works (Yadama & Drake, 1995). Items 4, 5, 7, 8, 10, 19, 37 were thus removed. The final model tested contained 34 items and the six correlated factors and the goodness of fit indicators obtained had values regarded as suitable from a statistical perspective. We used the normed model chi-square $\chi^2/df=2.17$ (values smaller than 3 considered indicative of good fit; Hu & Bentler, 1999), CFI = .91 (values close to or greater than 0.95 indicative of adequate fit; Hu & Bentler, 1999), TLI = .91 (values close to or greater than 0.95 indicative of adequate fit; Hu & Bentler, 1999), SRMR = .05 (values smaller than 0.09 indicative of good fit; Hu & Bentler, 1999), RMSEA = .04 (values close to .06 considered to be indicative of good fit and up to .08 indicative of adequate fit; Steiger, 2007).
We also used a chi-square difference test (Table 4). Consequently, it appears that the model with 34 items and six correlated factors constitutes the most representative solution.

Following the statistical analysis carried out we can state that the first hypothesis of the research is supported.

Table 2 Exploratory factor analysis (EFA) results: factor loadings for 6 factors

| Item no. | A priori scale | F1 Severity | F2 Benefits | F3 Susceptibility | F4 Barriers | F5 Cues to action | F6 Self-efficacy |
|----------|----------------|-------------|-------------|-------------------|-------------|-------------------|-----------------|
| 14       | Severity       | .78         | .13         |                   |             |                   |                 |
| 10       | Severity       | .71         | -1.1        |                   |             |                   |                 |
| 9        | Severity       | .69         |             |                   |             |                   |                 |
| 7        | Severity       | .68         | .22         | -1.2              | -11         |                   |                 |
| 15       | Severity       | .67         | .12         |                   |             |                   |                 |
| 18       | Severity       | .66         | .20         | -1.1              | -19         |                   |                 |
| 16       | Severity       | .65         | .25         |                   |             |                   |                 |
| 17       | Severity       | .64         |             | -1.0              |             |                   |                 |
| 8        | Severity       | .59         |             |                   | .17         |                   | .25             |
| 13       | Severity       | .59         | .16         |                   |             | .18               | -20             |
| 12       | Severity       | .48         |             | -1.6              | .29         | .17               | .22             |
| 11       | Severity       | .41         |             |                   |             |                   |                 |
| 20       | Benefits       |             | .87         |                   |             |                   |                 |
| 19       | Benefits       |             | .84         |                   |             |                   |                 |
| 22       | Benefits       |             | .84         |                   |             |                   |                 |
| 21       | Benefits       |             | .81         |                   |             |                   |                 |
| 23       | Benefits       |             | .74         |                   |             |                   | .23             |
| 41       | Self-Efficacy  | .50         |             |                   |             |                   | .48             |
| 1        | Susceptibility |             |             | .88               |             |                   |                 |
| 3        | Susceptibility |             |             | .87               |             |                   |                 |
| 4        | Susceptibility |             |             | .85               |             |                   | -12             |
| 2        | Susceptibility |             |             | .74               | .12         |                   | .11             |
| 6        | Susceptibility |             |             | .64               | .13         | .14               | .20             |
| 5        | Susceptibility |             |             | .45               | .57         |                   | -13             |
| 29       | Barriers       |             |             | .85               |             |                   |                 |
| 26       | Barriers       |             |             | .77               |             |                   |                 |
| 27       | Barriers       | .13         |             |                   | .77         |                   |                 |
| 24       | Barriers       |             |             |                   | .70         |                   |                 |
| 30       | Barriers       |             |             | .69               |             |                   | -25             |
| 28       | Barriers       |             |             | .60               |             |                   | .23             |
| 25       | Barriers       |             |             | .56               |             |                   | -36             |
| 31       | Barriers       | .31         |             | -.13              | .16         | .38               | -.28            |
| 34       | Cues Action    |             |             | -.80              |             |                   |                 |
| 35       | Cues Action    |             |             | .17               | -.74        |                   |                 |
| 32       | Cues Action    |             |             | -.12              | -.73        |                   |                 |
| 33       | Cues Action    | .14         |             | -.11              | -.64        |                   |                 |
| 36       | Cues Action    | .16         | .20         |                   | .13         | -.56              |                 |
| 39       | Cues Action    |             |             | -.17              | -.53        | .16               |                 |
| 38       | Cues Action    | -.12        | .22         |                   | -.52        |                   |                 |
| 37       | Cues Action    |             |             | .16               | -.48        | .31               |                 |
| 40       | Self-Efficacy  | .25         |             | -.20              | .65         |                   |                 |
| 42       | Self-Efficacy  | -.10        | .42         | -.18              | .55         |                   |                 |

% Variance 19.02 14.50 7.68 7.02 -.11 3.80

We also used a chi-square difference test (Table 4). Consequently, it appears that the model with 34 items and six correlated factors constitutes the most representative solution.

Following the statistical analysis carried out we can state that the first hypothesis of the research is supported.

Reliability

The reliability of each of the six subscales was assessed by use of the α Cronbach coefficient, interpreting the item/total-to-subscale correlations and calculating the test-retest
correlation for each of the subscales. α Cronbach coefficients ranged from .74 (for the self-efficacy subscale) to .87 (for the severity and benefits subscales) suggesting good internal consistency. Similarly, the test-retest coefficients calculated for each of the subscales were highly statistically significant, ranging from $r(127) = .47$, $p < .001^*$ (for the benefits subscale) and $r(127) = .69$, $p < .001^*$ (for the severity subscale). In addition, the item/total subscale correlations too were highly statistically significant (Table 5).

Thus, we can state that the second hypothesis of the study is also supported.

**Convergent Validity**

The convergent validity was assessed by analyzing the relationship between the various HBM constructs and similar constructs such as health anxiety, general self-efficacy, state of health, motivation to avoid unhealthiness and motivation to healthiness (Table 6). It was found that there is a moderate significant positive correlation between the susceptibility subscale and health anxiety ($r(500) = 0.30$, $p < .001^*$) and a moderate significant positive correlation between the severity subscale and health anxiety ($r(500) = 0.42$, $p < .001^*$). In addition, there is a small significant positive correlation between the benefits subscale and perception of state of health ($r(500) = 0.10$, $p < .001^*$). Also, there is a moderate significant positive correlation between cues to action and motivation to avoid unhealthiness ($r(500) = 0.45$, $p < .001^*$) and between cues to action and motivation to healthiness ($r(500) = 0.46$, $p < .001^*$). Additionally, it was established that there is also a significant positive correlation ($r(500) = 0.11$, $p < .001^*$) between the self-efficacy subscale of the HBM questionnaire and general self-efficacy.

Considering these results, we can state that the third research hypothesis is also supported.

### Table 3 Exploratory factor analysis (EFA) results: factor correlations

| Correlations | F1 Severity | F2 Benefits | F3 Susceptibility | F4 Barriers | F5 Cues Action | F6 Self-efficacy |
|--------------|------------|-------------|------------------|------------|---------------|----------------|
| F1 Severity  | 1          |             |                  |            |               |                |
| F2 Benefits  | .17        | 1           |                  |            |               |                |
| F3 Susceptibility | .22     | .10         | 1                |            |               |                |
| F4 Barriers  | .30        | −.11        | .15              | 1          |               |                |
| F5 Cues Action | −.04    | −.32        | −.08             | .38        | 1             |                |
| F6 Self Efficacy | −.09    | .19         | .04              | −.05       | −.08          | 1              |

### Table 4 Confirmatory factor analysis (CFA) results: goodness of fit statistics

| Model | χ² | Df | CFI | TLI | SRMR | RMSEA [90% CI] | Δχ² | Δdf |
|-------|----|----|-----|-----|------|----------------|-----|-----|
| 42 items, one factor | 7885.146** | 819 | .33 | .30 | .15 | .131 [0.12, 0.134] | 6770.8 | 307 |
| 42 items, six factorsa | 2901.877** | 819 | .80 | .79 | .14 | .07 [0.06, 0.074] | 1787.5 | 307 |
| 42 items, six factorsb | 2440.599** | 804 | .84 | .83 | .06 | .064 [0.061, 0.067] | 1326.3 | 292 |
| 41 items, six factorsb | 2321.11** | 764 | .85 | .83 | .06 | .064 [0.061, 0.067] | 1206.8 | 252 |
| 34 items, six factorsb | 1114.341** | 512 | .91 | .91 | .05 | .048 [0.045, 0.052] | – | – |

**p < 0.001

a non-correlated factors; b correlated factors

### Table 5 Test-Retest correlations, item-total subscale correlations, α Cronbach

| Number of items of the subscale | Test-Retest correlation (N=129) | Item-total Subscale correlation (N=502) | α Cronbach (N=502) |
|---------------------------------|--------------------------------|-----------------------------------------|-------------------|
| Susceptibility                  | .56**                          | .57-.80                                 | .85               |
| Severity                        | .69**                          | .40-.73                                 | .87               |
| Benefits                        | .47**                          | .64-.76                                 | .87               |
| Barriers                        | .52**                          | .48-.73                                 | .85               |
| Cues to Action                  | .61**                          | .45-.69                                 | .81               |
| Self-Efficacy                   | .68**                          | .59-.59                                 | .74               |

**p < 0.01
Criterion Validity

Since breast self-examination behavior had been operationalized as the ordinal variable with possible values “more than once a month”, “monthly”, “once every 2 months”, “once a year or less frequently”, “never”, criterion validity was verified by applying multinomial logistical regression. Criterion variable was frequency of breast self-examination and the predictor variables were the HBM constructs. The reference group was considered the group of those who say that they self-examine the breasts “more than once a month”, the other groups being compared with this group. According to the $\chi^2$ index, this model is statistically significant ($\chi^2(24, N=502) = 370.55, p < .001^*$). The model correctly predicts 52.6% of responses and the Cox and Snell $R^2$ is 52%. For the model, only barriers, cues to action and self-efficacy were significant predictors ($p < .001^*$) (Table 7).

The results of these analyses support the fourth hypothesis of the study.

Discussion

While CHBMS is an instrument frequently used to evaluate beliefs that influences a person’s decision to carry out breast self-examination, there has up until now been no Romanian version of it in existence. Considering the benefits of early detection of breast cancer for reducing mortality from this disease, it is important that such an instrument should be made available for women in Romania.

Table 6  Convergent validity

|      | Susc | Sev | Ben | Bar | Cues Act | Self Eff | SES | HA | HOS_MAH | HOS_MH | HOS_HS | HOS_HA |
|------|------|-----|-----|-----|----------|----------|-----|----|---------|--------|--------|--------|
| Susc |      |     |     |     |          |          |     |     |         |        |        |        |
| Sev  | .28**| 1   |     |     |          |          |     |     |         |        |        |        |
| Ben  | .14**| .35**| 1   |     |          |          |     |     |         |        |        |        |
| Bar  | .25**| .36**| −.01| 1   |          |          |     |     |         |        |        |        |
| Cues Act | .06 | .06 | .28**| .03| 1       |          |     |     |         |        |        |        |
| Self Eff | .09**| −.05| .40**| −.28**| .23**| 1 |
| SES  | −.17**| .14**| .04| −.25**| .26**| .11**| 1 |
| HA   | .30**| .42**| .15**| .19**| .03| −.06| −.21**| 1 |
| HOS_MAH | −.17**| −.25**| .04| −.25**| .26**| .11**| 1 |
| HOS_MH | −.19**| −.10*| .10*| −.18**| .46**| .14**| .43**| −.09**| .84**| 1 |
| HOS_HS | −.15**| −.07| .10*| −.11**| .41**| .13**| .43**| −.06| .71**| .75**| 1 |
| HOS_HA | .22**| .28**| .09| .15**| −.04| −.13**| −.13**| .46**| −.008| −.02| .008| 1 |

($**p<0.01$, $*p<0.05$)

Susc- Susceptibility, Sev- Severity, Ben- Benefits, Bar- Barriers, Cues Act- Cues to Action, Self Eff- Self- Efficacy, SES- Self Efficacy scale, HA- Short Health Anxiety Inventory, HOS_MAH- Motivation to Avoid Unhealthiness (Health Orientation Scale), HOS_MH- Motivation to Healthiness (Health Orientation Scale), HOS_HS-State of Health (Health Orientation Scale), HOS_HA- Health Anxiety (Health Orientation Scale)

Table 7  Criterion validity- results of multinomial logistical regression

|                      | Never Exp (B) | 95% CI | Annually or more rarely Exp (B) | 95% CI | Every 2 months Exp (B) | 95% CI | Monthly Exp (B) | 95% CI |
|----------------------|--------------|--------|---------------------------------|--------|------------------------|--------|-----------------|--------|
| Susceptibility       | 0.97         | 0.82–1.14| 1.06                           | 0.91–1.23| 1.07                   | 0.92–1.24| 0.99            | 0.86–1.15|
| Severity             | 0.93         | 0.87–1.00| 0.96                           | 0.90–1.03| 1.00                   | 0.94–1.07| 0.99            | 0.93–1.05|
| Benefits             | 1.02         | 0.89–1.16| 1.07                           | 0.94–1.21| 1.12                   | 0.98–1.28| 1.04            | 0.92–1.17|
| Barriers             | 1.27**       | 1.13–1.41| 1.11*                          | 1.00–1.24| 1.03                   | 0.93–1.15| 0.96            | 0.87–1.07|
| Cues to action       | 0.87*        | 0.80–0.96| 0.95                           | 0.87–1.04| 0.99                   | 0.90–1.08| 0.94            | 0.87–1.02|
| Self-Efficacy        | 0.26**       | 0.20–0.35| 0.42**                         | 0.33–0.54| 0.67**                 | 0.53–0.84| 0.78*           | 0.62–0.98|

Chi-square (df) 370.553
% Correct Predictions 52.6%
Cox and Snell $R^2$ 0.52

$**p<0.001; *p<0.05$
too. This study was aimed at evaluating the psychometric properties and factorial structure of CHBMS for a Romanian population. Our findings support structural validity, convergent validity, criterion validity, internal consistency, and test-retest reliability.

Exploratory factor analysis identified a structure with six factors. All the items concerned with susceptibility, severity, benefits, barriers, self-efficacy and cues to action loaded together in these factors. The six-subscale structure obtained through exploratory factor analysis was also supported by the results of confirmatory factor analysis. The latter highlighted a good fit of the six factors in the 34-item version of the questionnaire, with goodness of fit indicators attaining optimal values. Based on these results, we may affirm that the data obtained for the sample used in the analysis matched the theoretical structure. We also notice that the factorial structure obtained for the Romanian version of the questionnaire is similar to the structure of the original questionnaire as well as the structure of the translations available for Korean language (Lee et al., 2002) and Turkish language (Karayurt et al., 2008).

Our findings also support convergent validity. Severity and susceptibility show a significant positive correlation with health anxiety, benefits with state of health, cues to action with motivation to avoid unhealthiness and with motivation towards health, and self-efficacy in carrying out self-examination behavior shows a significant positive correlation with general self-efficacy.

Criterion validity too is supported by the results, with the HBM model being significant in predicting breast self-examination behavior. However, we notice the fact that only barriers, cues to action and self-efficacy were significant predictors. This is a difference from other studies that have found that all the variables in the model are significant predictors of breast self-examination (Ashton et al., 2001; Karayurt et al., 2008). The fact that most of the participants in this study were young people in good health and with no family history of cancer may be an explanation for the fact that for this sample the susceptibility to develop the disease, the severity of its consequences and the benefits of self-examination were not significant predictors.

For most of the subscales (susceptibility, severity, benefits, barriers, cues to action), the α Cronbach coefficients calculated indicated good internal consistency; for the self-efficacy subscale internal consistency was acceptable. These values are like those obtained in other studies (Champion, 1993; Dewi, 2018). Item-total subscale correlation coefficients were above 0.40, supporting a good differentiation between items (Polit & Beck, 2003). The high values obtained for test-retest subscale correlations provide further evidence of the reliability of this tool.

The existence of a tool for monitoring the breast self-examination has direct benefits for promoting the early detection of breast cancer. It can be used in various settings, such as hospitals, community health centers, or medical centers in companies to assess the adherence of the female population in Romania to this behavior but also the attitudes associated with breast cancer and self-examination. According to HBM, for people to perform early detection behaviors, it is necessary to have a high level of perception of the susceptibility to develop the disease but also of the severity of its consequences or of the necessary treatments. It is necessary to perceive a high level of the benefits of achieving the behavior and to have confidence in one's own ability to apply it. Therefore, if the evaluations show low levels of susceptibility, severity, benefits and self-efficacy and high levels of barriers, programmes can be designed that lead to the change of these beliefs. Thus, health professional (psychologists in the field of health psychology, nurses) can define interventions to transmit information about breast cancer and its early detection, which should highlight the personal benefits of self-examination but also highlight the resources that can be used to reduce obstacles to adopting this behavior. Changing these beliefs leads, according to HBM, to the adoption of self-examination, in this way women benefiting from early detection of the disease, increased chances of survival and better treatment options. This questionnaire can be used to evaluate the effectiveness of such interventions.

The solid psychometric qualities of this tool also recommend it to be used for research. Thus, studies aimed at testing HBM for the Romanian population and interventions based on this model can be performed without their internal consistency being threatened.

This study has several strong points, among them the fact that it evaluates multiple psychometric indices, but it also has its limitations. We should point out that the sample used was a convenience one and cannot therefore be regarded as representative of the Romanian population. Most participants were students so that data were collected from a homogeneous educated sample, which impacts the degree of generalization of the results. Again, since this instrument was initially created for the North American population, it is possible that it may not include beliefs about breast cancer and its prevention that depend on the cultural context.

Future studies could aim at the further testing of this tool on a representative population, and at creating and testing programmes to encourage breast self-examination among women in Romania. Such programs could include, in addition to HBM, other constructs studied in persuasion psychology such as need for cognition. The need for cognition has been highlighted in social and personality psychology (Cohen, 1957; Cacioppo & Petty, 1982), and recent studies have shown that matching message content to the affective or cognitive orientation of target individuals is important.
for achieving attitudinal change (Aquino et al., 2020). Thus, future research may investigate a possible relationship between HBM constructs and need for cognition, and if such an association is confirmed, its inclusion in future HBM-based interventions may help improve their effectiveness.

Conclusion

Early detection of breast cancer is essential to reducing the mortality of this condition. The results highlighted in this study indicate that the Romanian version of CHBMS has good psychometric properties and is a valid and reliable tool that can be used both in research and in clinical practice. Understanding women’s beliefs about breast cancer and its prevention is an essential element in the targeted designing of educational initiatives to promote the early detection of this type of cancer. This instrument may also be used to evaluate the effectiveness of interventions.

Author Contribution Adelina Mihaela Ștefănuț contributed to the concept, design of the work, data acquisition, analysis, interpretation of data, drafted the work and revised it.

Mona Vintilă contributed to conception, design of the work, data acquisition, interpretation of data, drafted the work and revised it.

Paul Sărăscu contributed to data analysis, interpretation of data, creation of new software used in the work and revised the work.

All authors read and approved the final manuscript.

Data Availability Data is available on the osf.io registry with registration doi https://doi.org/10.17605/OSF.IO/2MFS6. Also, the syntax, the code used and the tools described in this section are available on request.

Declarations

Competing Interests The authors have no conflicts of interest to disclose.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This research study has been approved by the Ethics Committee of the University of the West, Timisoara, Romania (decision 5222/03.02.2021).

Informed Consent All participants expressed informed consent.

References

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behavior and Human Decision Processes, 50(2), 179–211.

Akhbari-Zavare, M., Juni, M. H., Ismail, I. Z., Said, S. M., & Latiff, L. A. (2015). Barriers to breast self examination practice among Malaysian female students: A cross sectional study. SpringerPlus, 4, 692. https://doi.org/10.1186/s40064-015-1491-8

Ali, N. S. (2002). Prediction of coronary heart disease preventive behaviors in women: A test of the health belief model. Women & Health, 35(1), 83–96. https://doi.org/10.1300/j013v35n01_06

American Cancer Society. (2022). retrieved from https://www.cancer.org/content/dam/cancerorg/research/cancer-facts-and-figures/breast-cancer-facts-and-figures/2019-2020.pdf

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th edn) (DSM-IV). APA.

Aquino, A., Alparone, F. R., Pagliaro, S., Haddock, G., Maio, G. R., Perrucci, M. G., & Ebisch, S. J. H. (2020). Sense or sensibility? The neuro-functional basis of the structural matching effect in persuasion. Cognitive, Affective, & Behavioral Neuroscience, 20(3), 536–550. https://doi.org/10.3758/s13415-020-00784-7

Arrospide, A., Rue, M., van Ravesteyn, N. T., Comas, M., Larrañaga, N., Sarrigüeart, G., & Mar, J. (2015). Evaluation of health benefits and harms of the breast cancer screening programme in the Basque Country using discrete event simulation. BMC Cancer, 15, 671. https://doi.org/10.1186/s12885-015-1700-4

Ashton, L., Karnilowicz, W., & Fooks, D. (2001). The incidence and belief structures associated with breast self examination. Social Behavior and Personality, 29(3), 223–230. https://doi.org/10.2224/sbp.2001.29.3.223

Bandura, A. (1977). Social learning theory. Prentice-Hall.

Beaton, D., Bombardier, C., Guillemine, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. Spine, 25(24), 3186–3191. https://doi.org/10.1097/00006762-200012150-00014

Breckler, S. J. (1984). Empirical validation of affect, behavior, and cognition as distinct components of attitude. Journal of Personality and Social Psychology., 47(6), 1191–1205. https://doi.org/10.1037/0022-3514.47.6.1191

Brownson, R. C., Fielding, J. E., & Maylahn, C. M. (2009). Evidence-based public health: A fundamental concept for public health practice. Annual Review of Public Health, 30, 175–201. https://doi.org/10.1146/annurev.publhealth.031308.100134

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. Journal of Personality and Social Psychology, 42(1), 116–131. https://doi.org/10.1037/0022-3514.42.1.116

Calnan, M. (1984). The health belief model and participation in programmes for the early detection of breast cancer: A comparative analysis. Social Science & Medicine, 19(8), 823–830. https://doi.org/10.1016/0277-9536(84)90399-x

Campbell-Enns, H., & Woodgate R. (2015). The psychosocial experiences of women with breast cancer across the lifespan: A systematic review protocol. JBI Database of Systematic Reviews and Implementation Reports, 13(1). 112-21. 10.11124/jbisrir-2015-1795.

Carelli, I., Pompei, L. M., Mattos, C. S., Ferreira, H. G., Pescuma, R., Fernandes, C. E., & Peixoto, S. (2008). Knowledge, attitude and practice of breast self-examination in a female population of metropolitan São Paulo. The Breast, 17(3), 270–274. https://doi.org/10.1016/j.breast.2007.10.010

Champion, V. L. (1984). Instrument development for health belief model constructs. ANS. Advances in Nursing Science, 6(3), 73–85. https://doi.org/10.1097/00012272-198404000-00011

Champion, V. L. (1993). Instrument refinement for breast Cancer screening behaviors. Nursing Research, 42(3), 139–143. https://doi.org/10.1016/0006199-199305000-00003

Champion, V. L., & Skinner, C. S. (2008). The health belief model. In K. Glanz, B. K. Rimmer, & K. Viswanath (Eds.), Health behavior and health education- theory, research and practice. Jon Wiley & Sons.

Cohen, A. R. (1957). Need for cognition and order of communication as determinants of opinion change. In C. I. Hovland (Ed.), The order of presentation in persuasion. Yale University Press.
Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5th ed.). Allyn & Bacon/Pearson Education.

Tofan, M., Brătucu, G., Chițu, I. B., & Dovleac, L. (2018). Romania’s breast cancer and healthcare education. Journal of Smart Economic Growth, 3(2), 13–19.

Tolman, E. C. Purposive behavior in animals and men. Appleton-Century-Crofts, 1932.

Tuzcu, A., Bahar, Z., & Gözüm, S. (2016). Effects of interventions based on health behavior models on breast Cancer screening behaviors of migrant women in Turkey. Cancer Nursing, 39(2), E40–E50. https://doi.org/10.1097/NCC.0000000000000268

Vintilă, M., Ştefănuţ, A. M., & Sârbescu, P. (2019). Effectiveness of couple psycho-oncological interventions in increasing patients and their partners’ adaptation to disease: A systematic review and a meta-analysis. Current Psychology, 6, 1–23. https://doi.org/10.1007/s12144-019-00543-z

Vintilă, M., Todd, J., Goian, C., Tudorel, O., Bârbat, C. A., & Swami, V. (2020). The Romanian version of the intuitive Eating Scale-2: Assessment of its psychometric properties and gender invariance in Romanian adults. Body Image, 35, 225–236. https://doi.org/10.1016/j.bodyim.2020.09.009

Wang, Y., Zang, X.-Y., Bai, J., Liu, S.-Y., Zhao, Y., & Zhang, Q. (2014). Effect of a health belief model-based nursing intervention on Chinese patients with moderate to severe chronic obstructive pulmonary disease: A randomised controlled trial. Journal of Clinical Nursing, 23(9–10), 1342–1353. https://doi.org/10.1111/jocn.12394

Wdowik, M. J., Kendall, P. A., Harris, M. A., & Auld, G. (2001). Expanded health belief model predicts diabetes self-management in College Students. Journal of Nutrition Education, 33(1), 17–23. https://doi.org/10.1016/s1499-4046(06)60005-5

World Health Organization. (2021a). retrieved from https://www.who.int/health-topics/cancer#tab=tab_1

World Health Organization. (2021b). retrieved from https://www.who.int/health-topics/cancer#tab=tab_2

World Health Organization. (2021c). retrieved from https://www.who.int/cancer/country-profiles/ROU_2020.pdf

Yadama, G. N., & Drake, B. (1995). Confirmatory factor analysis of the Maslach burnout inventory. Social Work Research, 19(3), 184–193. https://doi.org/10.1093/swr/19.3.184

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