Development and validation of the MARA scale in Spanish to assess knowledge, risks and barriers relating to breast cancer prevention

Andrea Martínez-Urqujo
Hospital Cruz Roja De Gijon
Alvaro Postigo
Universidad de Oviedo
Marcelino Cuesta
Universidad de Oviedo
Fernández Alvarez Maria del Mar (fernandezmar@uniovi.es)
University of Oviedo: Universidad de Oviedo https://orcid.org/0000-0003-4603-2289
Ruben Martin-Payo
Universidad de Oviedo

Research Article

Keywords: Breast Neoplasm, Education, Health Promotion, Female cancers, Patient Education, Prevention

Posted Date: February 18th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-170266/v1

Version of Record: A version of this preprint was published at Cancer Causes & Control on July 8th, 2021. See the published version at https://doi.org/10.1007/s10552-021-01473-7.

Abstract

Objective

The aim of this study was to develop a measurement instrument for assessing knowledge of breast cancer and perceived risk of developing the disease (MARA).

Methods

641 women with a mean age of 36.19 years (SD = 7.49) was used. Data collection took place during 2019 and included sociodemographic data, data on history of cancer and breast cancer and perceived risk and feelings of concern about developing breast cancer. Internal consistency, test-retest reliability, convergent validity, and structural validity were tested.

Results

The questionnaire items comprise 4 subscales: risk factors; signs and symptoms; perceived risk; barriers. A factor analysis revealed that the first two subscales had two dimensions each, whereas the other two subscales had one dimension each. Each subscale was shown to have adequate reliability ($\alpha = 0.74–0.92$) and temporal stability ($r = 0.201–0.906$), as well as strong evidence of validity in relation to a questionnaire on breast cancer knowledge ($r = 0.131–0.434$). In addition, the subscales were shown to have high discriminatory power in terms of the presence or absence of a history of cancer or breast cancer, perceived risk, and feelings of concern.

Conclusion

The MARA questionnaire exhibits adequate psychometric properties for assessing knowledge of breast cancer as required in research and professional contexts.

1. Introduction

A large proportion of the most prevalent conditions of our time are associated with unhealthy behaviours. Specifically, there is evidence to suggest that engaging in healthy behaviours contributes to the prevention of cancer [1].

According to the Health Belief Model (HBM), the following factors influence whether or not a person makes behavioural changes when faced with a potential risk of developing a condition: their perception of the severity of the condition, their susceptibility to the condition, the benefits that a change in behaviour will have on prevention of the condition, and the perceived difficulties in implementing the recommended changes in behaviour [2]. In addition, the amount of knowledge an individual possesses about the condition also influences their intentions to change their behaviour. For instance, when an individual has adequate knowledge,

they may have greater motivation and reflective capacity, which could positively influence their intention to change their behaviour [3].

For these reasons, the availability of a tool for assessing an individual's perceived risk, ability to engage in preventive behaviours, and knowledge about a particular condition is essential, so that disease prevention and health promotion strategies can be implemented to encourage healthy lifestyles.

This is even more important when it comes to breast cancer, which is one of the main health problems affecting women around the world, and Spain is no exception. A number of behaviours that can be addressed and modified play a major role in the development of breast cancer [4].

A recently published review explored the factors influencing women's decisions to participate in breast cancer prevention programmes, identifying the following: their perceived susceptibility to developing breast cancer, efforts required on their part to engage in healthy behaviours, their perceived competence, and their autonomy in carrying out the programme, among others [5]. These findings reinforce the importance of women being aware of the signs and symptoms of breast cancer [6] and their ability to identify them early, so that the interval between the onset of the first symptoms and the first consultation with their healthcare provider is as short as possible [4] and their prognosis can be improved [7]. In addition, identifying the risk of developing breast cancer would facilitate the development of interventions based on individual needs [4] coinciding with women's preferences for receiving personalised information about their risks [5].

Several tools are currently available for assessing a woman's level of knowledge of breast cancer and her perceived risk of developing the disease [8, 9]. These tools can be very helpful, as they allow women to identify their risks and enable health professionals to establish a personalised intervention in collaboration with each patient [10].

1.1 Aim

As we were unable to identify any validated questionnaires in Spanish specifically assessing a combination of the aforementioned aspects, the objective of our study is to design the MARA questionnaire to assess levels of knowledge of breast cancer and the perceived risk of developing it and analyse its metric properties.

2. Methods

2.1 Participants

This cross-sectional study was carried out in 2019. In order to fulfil the aforementioned objectives, the self-administered questionnaire was distributed by email, text message, and social media. A convenience sampling method was used. Women and trusted individuals who had collaborated with the research team on previous studies were contacted via email, text message, and social media. In addition, after 2-3 weeks, the instrument was administered again (test-retest) to a total of 30 women randomly selected from among the participants.

2.2 Instruments

The MARA questionnaire. The MARA questionnaire was based on the b-CAS questionnaire [11], with the addition of eight questions: one question relating to individual aspects and seven relating to breast cancer knowledge. The b-CAS questionnaire consists of 9 items on sociodemographic aspects and 53 items on different aspects of breast cancer divided into five categories: 1. knowledge of risk factors, 2. knowledge of signs and symptoms, 3. attitude towards breast cancer prevention, 4. barriers to early breast cancer screening techniques, and 5. displaying breast cancer prevention behaviours.

With the permission of Professor Rakkapao, the b-CAS questionnaire was translated into Spanish following the back-translation procedure proposed by the World Health Organisation [12]. Initially, two native Spanish speakers with a good command of English translated the original version into Spanish independently. Both translations were independently compared by two researchers, who identified and amended any inaccurate or ambiguous expressions and concepts. Six items were removed, as their content was not suitable for the Spanish context. The consensus version was blind- and back-translated into English by an independent translator, whose rendition was then compared with the original by another member of the research team to ensure semantic equivalence. The questionnaire was administered to five women from outside the field of healthcare who assessed each item in order to test its understandability, acceptability, and applicability. The final version of the MARA questionnaire was then produced, comprising two sections. The first section contains 7 items on individual variables and the second section contains 47 items divided into five scales: risk factors (18 items), signs and symptoms (12 items), perceived risk and ability to engage in preventive behaviours (8 items), and barriers to engaging in preventive behaviours (9 items). Knowledge-related questions were coded with 3 response options (yes/no/I don't know). Correct answers scored 1 point, while incorrect answers or no answer scored 0 points. Questions relating to "perceived risk of developing breast cancer" and "barriers to breast cancer prevention" were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In order to assess content validity, the MARA questionnaire was administered to 10 women, who assessed the clarity and understandability of its items. None of them reported any issues. The questionnaire was also sent to five experts in instrument development and healthcare (breast cancer care specialists), who assessed and amended the wording and position of the items, resulting in no items being removed or altered.

Knowledge, perceived risk, and concern regarding breast cancer

In the absence of a 'gold standard' instrument, the MARA questionnaire was administered along with questions written by Seven et al. [13]. The questionnaire consists of 12 questions measuring knowledge, perceived risk, and concerns regarding breast cancer. The questionnaire response format is 0=wrong answer/does not know and 1=right answer. Reliability, as measured with Cronbach's alpha, was .78. A positive relationship between the scores of the two questionnaires was hypothesised.

2.3 Psychometric properties of the MARA

Descriptive statistics, reliability, and temporal stability of scores. The descriptive statistics of the items (mean, standard deviation, skewness, and kurtosis) were analysed. The reliability of each scale was calculated using coefficient alpha for ordinal data [14] and McDonald's coefficient omega [15]. In order to explore the stability of the scores, test-retest reliability was also calculated using Pearson's correlation and intraclass correlation.

Validity. *Construct validity* was assessed using exploratory factor analysis (EFA). The Unweighted Least Squares (ULS) method was used to estimate the parameters in the EFA, and the Optimal Implementation of Parallel Analysis (OIPA) was used to determine the number of dimensions of each scale [16]. In scales where the parallel analysis indicated more than one factor, oblique (oblimin) rotation was used. The Comparative Fix Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were used as adjustment statistics, with CFI>.95 and RMSEA<.08 indicating a good fit [17]. After studying the factor structures, Pearson's correlations between the different scales of the questionnaire were analysed. Evidence of validity in relation to other variables was tested using Pearson's correlation between the MARA and a breast cancer knowledge questionnaire by Seven et al. [13]. Evidence of validity with regard to discriminatory power was studied by analysing possible differences between scales in terms of the presence or absence of a family history of cancer and breast cancer. To this end, a *t*-test for independent samples was conducted by comparing means. An ANOVA was performed to check for any differences in perceived risk (none/low/moderate/high) and feelings of concern about developing breast cancer (none/low/moderate/high). To identify groups between which there were differences, a Bonferroni post-hoc test was carried out. Effect sizes were also calculated via Cohen's *d*, with 0.2-0.4 indicating a small effect size, 0.5-0.7 indicating a moderate effect size, and 0.7 and above indicating a large effect size [18].

The various EFAs and reliability tests were performed using the program FACTOR 10.5.03 [19]. The other analyses were carried out using SPSS 24 (IMB Corp, 2016).

3. Results

3.1. Characteristics of the participants

A total of 641 women, all Spanish nationals, with a mean age of 36.19 years (SD=7.49) participated. 72.4% of them had a university education. 48.8% were single, 44.9% were married, 6.1% were divorced, and 0.2% were widowed. 77.4% had a history of cancer, and 28.1% had a history of breast cancer.

3.2. Psychometric properties

Construct validity. Items with factor weights below 0.30 were eliminated. As a result, 9 items on the risk factors scale, 3 items on the signs and symptoms scale, 2 items on the perceived risk scale, and 2 items on the barriers scale were eliminated. Table 1 shows the final number of items (31). The OIPA suggested two dimensions for the risk factors and signs and symptoms scales, and a single dimension for the perceived risks and barriers scales. Model fits were adequate for all scales (Table 1). Table 2 shows the factorial weights for each item, all of which exceed 0.45. The correlations between the two dimensions that make up the risk factors scale and the signs and symptoms scale are adequate (r=0.40 and r=0.30, respectively).

Descriptive statistics, reliability, and temporal stability of scores. Regarding the descriptive statistics of the items, the kurtosis of items 3 and 4 of dimension 1 of the signs and symptoms scale and the kurtosis of items 2 and 4 of dimension 2 of this subscale stand out in particular (Table 3). Reliability was adequate for all scales (Table 3). In addition, with the exception of the specific signs and symptoms scale, the temporal stability of the scores was shown to be adequate (Table 4).

Evidence of validity in relation to other variables. Both modifiable and non-modifiable risk factor scales showed a correlation with the breast cancer knowledge questionnaire of 0.341 [95% CI=0.271; 0.408] and 0.434 [95% CI=0.369; 0.495], respectively. In turn, the breast cancer knowledge questionnaire showed a correlation of 0.394 [95% CI=0.326; 0.457] with the non-specific signs and symptoms scale versus a correlation of 0.131 [95% CI=0.054; 0.206] with the specific signs and symptoms scale. Finally, the perceived risk scale showed a correlation of 0.320 [95% CI=0.248; 0.388] with the breast cancer knowledge questionnaire, whereas the barriers scale showed a correlation of -0.230 [95% CI=-0.155; -0.303].

Evidence of validity with regard to discriminatory power. Differences in modifiable risk factors are apparent, with women with a family history of cancer scoring significantly higher. Differences can also be identified on the barriers scale, with women with no history of breast cancer scoring significantly higher (Table 5). Finally, it is also important to note that women with higher levels of perceived risk exhibited lower knowledge of barriers and greater knowledge of signs and symptoms (Table 6).

4. Discussion

The MARA questionnaire for assessing knowledge of breast cancer, perceived risk of developing breast cancer, and perceived barriers regarding breast cancer prevention has been shown to have adequate psychometric properties for use in Spanish-speaking women. To the best of our knowledge, there is no tool available in Spanish that has the same characteristics as the MARA questionnaire.

The MARA questionnaire consists of four scales: risk factors, signs and symptoms, perceived risks, and perceived barriers. The risk factors scale displayed a two-dimensional structure, with two subscales: modifiable risk factors and non-modifiable risk factors. The signs and symptoms scale also exhibited a two-dimensional structure consisting of specific signs and symptoms—associated with breast cancer by the general population—and non-specific signs and symptoms—associated with other breast conditions by the general population. Both scales (risk factors and signs and symptoms) showed a strong correlation between their subscales, allowing a total score to be obtained. Both the perceived risks and the barriers scales exhibited an essentially one-dimensional structure. Along with the fact that all the scales showed strong correlations between one another, this demonstrates that the scales constitute a significant body of knowledge on breast cancer.

Internal consistency was adequate for all scales, as shown by both Cronbach's alpha and McDonald's omega coefficients, ranging from 0.77 to 0.92. The scales also show adequate temporal stability in general [20].

In terms of evidence of validity in relation to other variables, the battery of questions in the MARA showed evidence of convergent validity [21], given that all the scales that it comprises showed strong correlations with the breast cancer knowledge questionnaire [13].

With respect to the discriminatory power of the battery of questions, differences in the risk factors scale based on the presence or absence of a family history of cancer stand out, with women with a family history of cancer scoring significantly higher. In addition, when looking at the barriers scale, women with no history of breast cancer show significantly higher scores. These results are consistent with those observed in previous studies. In addition, several authors suggest that having loved ones with a history of cancer acts as a facilitator for the development of preventive attitudes [22] and behaviours [23].

The MARA questionnaire has been shown to be effective in assessing knowledge of risk factors related to breast cancer, signs and symptoms of breast cancer, perceived individual risk of developing breast cancer, ability to engage in preventive behaviours, and barriers to breast cancer prevention. This information can help healthcare workers to meet women's needs in relation to breast cancer prevention.

On a personal level, possessing knowledge increases intentions to adopt healthy behaviours [24]. Specifically, in the case of breast cancer, it acts as a mediating factor in predicting breast cancer screening practice [5, 25]. Additionally, as the HBM suggests, an absence of knowledge directly affects perception [2].

Failure to perceive the existence of a health problem may lead to a failure to take action to prevent or address said problem. When women are aware of the risk factors for breast cancer, they are better placed to perceive their actual risk of developing the disease [26]. This can be used in clinical practice to implement individualised prevention and screening strategies [27].

In addition, identifying needs relating to the dimensions covered by the MARA allows these needs to be addressed and met, which can help women to take an active role not only in preventing the condition, but also in detecting it promptly. It should be borne in mind that prevention plans in Spain are standardised and their inclusion criteria are essentially based on women's age and individual and family history of breast cancer. For example, women and immediate relatives of women who have not had breast cancer are included in prevention programmes from the age of 50 onwards, which does not appear reasonable given the multiple causes associated with this type of cancer. This is demonstrated in a study by Mukama et al. [28], which suggests a need to establish specific screening plans for these women and not to select exclusively on the basis of personal or family history. In the same vein, other authors have stated that public health initiatives should prioritise breast cancer prevention and early detection among women, paying special attention to women with a lack of knowledge, perception, and awareness of this type of cancer [29].

One limitation of our study is that the sample may not be representative. Culture and society determine behaviour, so the items of the MARA should be reviewed before use in other Spanish-speaking regions, such as Hispanic America.

Confirming the psychometric properties of the MARA questionnaire has important clinical implications. The MARA questionnaire can be used in healthcare and gynaecological facilities to assess Spanish women's knowledge, risks, perceptions, and barriers regarding breast cancer. The results of such an assessment may be used to inform educational and counselling interventions for addressing women's misconceptions and improving their knowledge about breast cancer.

5. Conclusion

The MARA questionnaire has adequate internal consistency and an adequate factor structure. It therefore represents a valid, reliable tool for assessing Spanish women's knowledge, risks, perceptions, and barriers regarding breast cancer.

Declarations

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of Interest: The authors declare no conflict of interest.

Availability of data and material (data transparency) Research data are no shared.

Code availability: Not aplicable

Author contributions: All authors contributed to the study conception and design. Material preparation and data collection were performed by [Andrea Martínez-Urquijo], [María del Mar Fernández-Álvarez] and [Rubén Martín-Payo]. Data analysis was performed by [Álvaro Postigo] and [Marcelino Cuesta]. The first draft of the manuscript was written by [Rubén Martín-Payo], [Andrea Martínez-Urquijo] and [Álvaro Postigo] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethical approval: Ethics approval was obtained from the Principality of Asturias Research Ethics Committee (protocol number 147/19).

Human and animal rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the research committee and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individual participants included in the study.

Consent to participate: written informed consent obtained from all the participants

Consent for publication: Not applicable

References

1. Schüz J, Espina C, Wild CP (2019) Primary prevention: a need for concerted action. Mol Oncol 13(3):567–578. https://doi.org/10.1002/1878-0261.12432
2. Coleman MT, Pasternak RH (2012) Effective strategies for behavior change. Prim Care 39(2):281–305. https://doi.org/10.1016/j.pop.2012.03.004
3. Michie S, van Stralen MM, West R (2011) The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implement Sci 6:42. https://doi.org/10.1186/1748-5908-6-42
4. Marzo-Castillejo M, Vela-Vallespín C, Bellas-Beceiro B et al (2018) Recomendaciones de prevención del cáncer. Actualización PAPPS 2018. Aten Primaria 50(Suppl 1(Suppl 1):41–65. https://doi.org/10.1016/S0212-6567(18)30362-7
5. Rainey L, van der Waal D, Wengström Y, Jervaeus A, Broeders M (2018) Women's perceptions of the adoption of personalised risk-based breast cancer screening and primary prevention: a systematic review. Acta Oncol (Stockholm Sweden) 57(10):1275–1283. https://doi.org/10.1080/0284186X.2018.1481291
6. Ozanne E, Karliner LS, Tice JA et al (2019) An Intervention Tool to Increase Patient-Physician Discussion of Lifestyle Risk Factors for Breast Cancer. J Womens Health 28(11):1468–1475. https://doi.org/10.1089/jwh.2018.7026

7. Sanz-Barbero B, Prieto-Flores ME, Otero-García L, Abt-Sacks A, Bernal M, Cambas N (2014) Perception of risk factors for cancer in the Spanish population. Gac Sanit 28(2):137–145. https://doi.org/10.1016/j.gaceta.2013.10.008
8. Linsell L, Forbes LJ, Burgess C, Kapari M, Thurnham A, Ramirez AJ (2010) Validation of a measurement tool to assess awareness of breast cancer. Eur J Cancer 46(8):1374–1381. https://doi.org/10.1016/j.ejca.2010.02.034
9. Solikhah S, Promthet S, Rakkapao N, Hurst CP (2017) Validation of an Indonesian Version of the Breast Cancer Awareness Scale (BCAS-I). Asian Pac J Cancer Prev 18(2):515–522. https://doi.org/10.22034/APJCP.2017.18.2.515
10. Córdoba García R, Camarelles Guillem F, Muñoz Seco E et al (2018) Recomendaciones sobre el estilo de vida. Actualización PAPPS 2018. Aten Primaria 50(Suppl 1):29–40. https://doi.org/10.1016/S0212-6567(18)30361-5. Suppl 1) .
11. Rakkapao N, Promthet S, Moore MA, Hurst CP (2016) Development of a Breast Cancer Awareness Scale for Thai Women: Moving towards a Validated Measure. Asian Pac J Cancer Prev 17(2):851–856. https://doi.org/10.7314/apjcp.2016.17.2.851
12. World Health Organization (2016) Process of translation and adaptation of instruments. http://www.who.int/substance_abuse/research_tools/translation/en/. Accesed 24 October 2020
13. Seven M, Bağcivan G, Akyuz A, Bölükbaş F (2018) Women with Family History of Breast Cancer: How Much Are They Aware of Their Risk? J Cancer Educ 33(4):915–921. https://doi.org/10.1007/s13187-017-1226-3
14. Elosua Oliden P, Zumbo BD (2008) Coefficients of feasibility for ordinal response scales. Psicothema 20(4):896–901
15. McDonald RP (1999) Test theory: A unified treatment. Psychology Press, New York
16. Timmerman ME, Lorenzo-Seva U (2011) Dimensionality assessment of ordered polytomous items with parallel analysis. Psychol Methods 16(2):209–220. https://doi.org/10.1037/a0023353
17. Hu LT, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model 6(1):1–55. https://doi.org/10.1080/10705519909540118
18. Cohen J (1988) Statistical power analysis for the behavioral sciences, 2nd edn. Lawrence Earlbaum Associates, New Jersey
19. Ferrando PJ, Lorenzo-Seva U (2017) Program FACTOR at 10: Origins, development and future directions. Psicothema 29(2):236–240. https://doi.org/10.7334/psicothema2016.304
20. Muñiz J, Fonseca-Pedrero E (2019) Ten steps for test development. Psicothema 31(1):7–16. https://doi.org/10.7334/psicothema2018.291
21. Evers A, Muñiz J, Hagemeister C et al (2013) Assessing the quality of tests: revision of the EFPA review model. Psicothema 25(3):283–291. https://doi.org/10.7334/psicothema2013.97
22. Haug U, Riedel O, Cholmakow-Bodechtel C, Olsson L (2018) First-degree relatives of cancer patients: a target group for primary prevention? A cross-sectional study. Br J Cancer 118(9):1255–1261. https://doi.org/10.1038/s41416-018-0057-2

23. Bostean G, Crespi CM, McCarthy WJ (2013) Associations among family history of cancer, cancer screening and lifestyle behaviors: a population-based study. Cancer Causes Control 24(8):1491–1503. https://doi.org/10.1007/s10552-013-0226-9
24. Frieden TR (2010) A framework for public health action: the health impact pyramid. American J Public Health 100(4):590–595. https://doi.org/10.2105/AJPH.2009.185652
25. Firouzbakht M, Hajian-Tilaki K, Bakhtiari A (2020) Comparison of competitive cognitive models in explanation of women breast cancer screening behaviours using structural equation modelling: Health belief model and theory of reasoned action. Eur J Cancer Care e13328. https://doi.org/10.1111/ecc.13328
26. Chung C, Lee SJ (2013) Estimated risks and optimistic self-perception of breast cancer risk in Korean women. Appl Nurs Res 26(4):180–185. https://doi.org/10.1016/j.apnr.2013.06.001
27. Lippey J, Keogh LA, Mann GB, Campbell IG, Forrest LE (2019) "A Natural Progression": Australian Women's Attitudes About an Individualized Breast Screening Model. Cancer prev res 12(6):383–390. https://doi.org/10.1158/1940-6207.CAPR-18-0443
28. Mukama T, Fallah M, Tian Y et al (2020) Risk-tailored starting age of breast cancer screening based on women's reproductive profile: A nationwide cohort study. Eur J Cancer 124:207–213. https://doi.org/10.1016/j.ejca.2019.10.011
29. Yeung M, Chan E, Wong S, Yip B, Cheung PS (2019) Hong Kong female's breast cancer awareness measure: Cross-sectional survey. World J Clin Oncol 10(2):98–109. https://doi.org/10.5306/wjco.v10.i2.98

Tables

Table 1.

Exploratory factor analysis of the different scales in the battery of questions

	Number of items	Number of factors	KMO[a]	Bartlett's test (*p*)	% variance explained	CFI[b]	RMSEA[c]
Risk factors	9	2	.74	<.001	71.1	.964	.101
Signs and symptoms	9	2	.69	<.001	58.8	.971	.087
Perception	6	1	.65	<.001	46.7	.936	.151
Barriers	7	1	.80	<.001	52.5	.979	.088

[a]KMO=Kaiser-Meyer-Olkin test; [b]CFI=comparative fit index; [c]RMSEA=root mean square error of approximation

Table 2. Correlation matrix between the different scales in the battery of questions

	Signs and symptoms (specific)	Signs and symptoms (non-specific)	Signs and symptoms	Perception	Barriers
Non-modifiable risk factors	.056	.364	.313	.261	-.104
Modifiable risk factors	.054	.340	.293	.415	-.091
Risk factors (total)	.068	.434	.374	.413	-.121
Signs and symptoms (specific)				.163	-.079
Signs and symptoms (non-specific)				.211	-.128
Signs and symptoms (total)				.245	-.139
Perception					-.136

Table 3. Descriptive statistics, factor weights, and reliability of the scales in the battery of questions

Subscale	Item	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	Factor weight	α	ω
Non-modifiable risk factors	01 TH	0.47	0.5	0	1	0.12	-1.99	.476	.85	.86
	02 Menarche	0.12	0.32	0	1	2.37	3.61	.789		
	03 Menopause	0.21	0.21	0	1	1.42	0.02	.730		
	04 Infertile	0.27	0.27	0	1	1.02	-0.96	.762		
	05 Children<30	0.21	0.21	0	1	1.46	0.13	.859		
	Total	1.28	1.40	0	5	1.042	.228	-		
Modifiable risk factors	01 Fats	0.71	0.71	0	1	-0.91	-1.18	.843	.92	.92
	02 Overweight	0.72	0.72	0	1	-0.98	-1.05	.988		
	03 Smoking	0.87	0.87	0	1	-2.21	2.90	.903		
	04 Wine	0.34	0.34	0	1	0.66	-1.57	.650		
	Total	2.64	1.31	0	4	-0.78	0.23	-		
Risk factors (total)		3.92	2.21	0	9	0.15	-.45	-	.88	.88
Signs and symptoms (specific)	01 Swelling	0.92	0.28	0	1	-3.04	7.25	.677	.74	.74
	02 Breast pain	0.72	0.45	0	1	-0.97	-1.06	.596		
	03 Lump in armpit	0.95	0.22	0	1	-3.99	14.03	.735		
	04 Lump in breast	0.95	0.21	0	1	-4.30	16.55	.540		
	Total	3.54	0.74	0	4	-1.81	3.73	-		
Signs and symptoms (non-specific)	01 Discharge	0.83	0.38	0	1	-1.73	1.00	.639	.84	.84
	02 Changes	0.93	0.26	0	1	-3.37	9.40	.561		
	03 Tightness	0.47	0.50	0	1	0.10	-2.00	.590		
	04 Stretch marks	0.04	0.21	0	1	4.48	18.09	.507		
	05 Dimple	0.53	0.50	0	1	-0.14	1.99	.998		
	Total	2.81	1.20	0	5	-0.43	-0.46	-		
Signs and symptoms (total)		6.34	1.53	0	9	-0.74	0.72	-	.81	.81
Perception	01	4.38	0.73	1	5	-1.03	0.83	.674	.77	.77
	02	4.59	0.64	1	5	-1.70	3.36	.501		
	03	3.89	0.84	1	5	-0.30	-0.22	.394		
	04	4.85	0.40	1	5	-2.56	6.11	.418		
	07	4.01	0.83	1	5	-0.25	-0.92	.828		
	08	4.03	0.84	1	5	-0.42	-0.47	.761		
	Total	25.74	2.75	6	30	-0.35	-0.25	-		
Barriers	01	1.93	1.03	1	5	1.02	0.41	.692	.85	.85
	02	1.75	0.90	1	5	1.16	1.10	.699		
	03	1.71	1.00	1	5	1.33	0.83	.779		
	06	1.68	0.88	1	5	1.31	1.25	.742		
	07	2.65	1.19	1	5	0.40	-0.68	.456		
	08	2.29	1.30	1	5	0.63	0.89	.586		
	09	1.92	1.13	1	5	1.07	0.20	.697		
	Total	13.92	4.91	7	35	0.80	0.31	-		

Table 4. Temporal stability of the scores of the different scales in the battery of questions

	Pearson's *r* [95% CI]	Intraclass correlation [95% CI]
Non-modifiable risk factors	.882 [.765; .943]	.937 [.868; .970]
Modifiable risk factors	.804 [.625; .903]	.892 [.772; .949]
Risk factors (total)	.906 [.811; .955]	.952 [.900; .977]
Signs and symptoms (specific)	.201 [-.171; .524]	.328 [-.369; .675]
Signs and symptoms (non-specific)	.639 [.362; .812]	.718 [.415; .865]
Signs and symptoms (total)	.530 [.210; .748]	.654 [.287; .834]
Perception	.796 [.610; .898]	.885 [.760; .945]
Barriers	.781 [.586; .891]	.866 [.720; .936]

Table 5. Differences between the scales in the battery of questions depending on the presence or absence of a history of cancer

	Family history of cancer				Family history of breast cancer			
	M[a] No	*M*[a] Yes	t[b] (p[c])	*d*[d]	*M*[a] No	*M*[a] Yes	t[b] (p[c])	*d*[d]
Non-modifiable risk factors	1.25	1.30	-0.37 (.709)	0.04	1.24	1.34	-0.88 (.379)	0.08
Modifiable risk factors	2.36	2.73	-2.72 (.007)	0.29	2.61	2.63	-0.16 (.877)	0.02
Risk factors (total)	3.61	4.03	-1.84 (.068)	0.19	3.85	3.97	-0.65 (.518)	0.06
Signs and symptoms (specific)	3.48	3.56	-1.06 (.288)	0.10	3.55	3.50	0.84 (.402)	0.08
Signs and symptoms (non-specific)	2.61	2.86	-2.22 (.027)	0.21	2.72	2.83	-0.98 (.328)	0.09
Signs and symptoms (total)	6.09	6.42	-2.25 (.025)	0.22	6.28	6.33	-0.36 (.717)	0.03
Perception	25.52	25.81	-1.11 (.266)	0.11	25.80	25.56	1.01 (.313)	0.09
Barriers	13.92	13.96	-0.86 (.931)	0.01	14.49	12.76	4.22 (<.001)	0.35

[a]*M*=mean; [b]t=testing statistic; [c]p=level of statistical significance; [d]*d*=effect size.

Table 6. Differences between the scales in the battery of questions depending on the degree of perceived risk and feelings of concern

	Perceived risk							Feelings of concern						
	M[i] N[e]	*M*[i] L[f]	*M*[i] Mo[g]	*M*[i] H[h]	F[j] (p)	*d*[k]	Post hoc	*M*[i] N[e]	*M*[i] L[f]	*M*[i] Mo[g]	*M*[i] H[h]	F[j] (p)	*d*[k]	Post hoc
Modifiable RFs[a]	0.88	1.21	1.32	1.46	1.09 (.353)	0.09		1.33	1.26	1.20	0.94	0.85 (.469)	0.07	
Non-modifiable RFs	1.94	2.55	2.72	2.82	2.75 (.042)	0.22		2.52	2.77	3.05	2.48	3.84 (.010)	0.31	a with c
RFs (total)	2.81	3.76	4.04	4.28	2.70 (.045)	0.22		3.85	4.04	4.25	3.42	1.29 (.278)	0.11	
SS[b] (specific)	3.13	3.59	3.51	3.53	2.19 (.089)	0.17		3.55	3.53	3.52	3.39	0.49 (.691)	0.04	
SS (non-specific)	2.06	2.77	2.87	2.88	2.46 (.062)	0.20		2.75	2.82	3.08	2.87	1.43 (.232)	0.12	
SS (total)	5.19	6.36	6.38	6.41	3.20 (.023)	0.26	a with b a with c a with d	6.30	6.35	6.60	6.26	0.74 (.527)	0.06	
P[c]	24	25.9	25.8	25.4	2.76 (.041)	0.22		25.8	25.6	26.1	25.1	1.22 (.301)	0.10	
B[d]	18.4	14	13.8	13.2	4.43 (.004)	0.36	a with b a with c a with d	14.1	13.7	13.4	14.1	0.50 (.683)	0.05	

[a]RFs=risk factors; [b]SS=signs and symptoms; [c]P=perception; [d]B=barriers; [e]N=none; [f]L=low; [g]Mo= moderate; [h]H=high; [i]*M*=mean; [j]F=testing statistic; [k]*d*=effect size.p= level of statistical significance;