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Perform a mammography: Motives' inventory

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Abstract:	<p>Introduction: This study examines the motives of women for agreeing or refusing to have a mammogram. Method: Three hundred and ten participants were recruited. Two questionnaires listing the motives for undergoing or refusing to undergo a mammogram were developed. Intolerance of uncertainty, worry, anxiety, personality were respectively rated by: EII, QIPS, GAD-7, BHI-24. Result: Seven facilitators were interpreted within the framework of Reversal Theory: Interest of early diagnosis, Quality of care, Habit, Collectivist perspective, Following the doctor's advice, Cancer(s) in entourage, Hypochondriac beliefs. Six barriers were revealed: Absence of cancer in entourage, Anxiety, Physical and moral pain, Lack of information, Spatiotemporal difficulties, Aspiration for freedom. The frequency of mammography was positively linked to the age, number of children, Habit, and negatively to Physical and moral pain, Lack of information and Spatiotemporal difficulties. Age and Habit had a positive effect on the frequency of screening while the Spatiotemporal difficulties had a negative effect. Conclusion: This study provides a better understanding of the motives that lead women to accept or refuse performing this examination. It could be useful to the medical profession and more broadly to the field of public health.</p>
Secondary Abstract:	<p>Introduction : Cette étude examine les motifs des femmes à accepter ou refuser la réalisation d'une mammographie. Elle investigate également les liens entre les facteurs motivationnels, l'âge, le nombre d'enfant(s), l'intolérance à l'incertitude, l'inquiétude, l'anxiété, la personnalité et la fréquence de réalisation des mammographies.</p> <p>Méthode : Trois-cent-dix participantes ont été recrutées. Deux questionnaires répertoriant les motifs à accepter et à refuser la réalisation d'une mammographie ont été élaborés grâce aux données de la littérature et à des entretiens semi-directifs. L'intolérance à l'incertitude, l'inquiétude, l'anxiété et la personnalité ont été respectivement évaluées par l'EII, le QIPS, le GAD-7 et le BHI-24. L'âge, le nombre d'enfant(s) ainsi que la fréquence de réalisation des mammographies ont également été renseignés.</p> <p>Résultat : Sept facteurs motivationnels facilitateurs ont été mis en lumière et interprétés au regard de la Théorie du Renversement : « Intérêt du diagnostic précoce », « Qualité de la prise en charge », « Habituation », « Perspective collectiviste », « Suivre l'avis du médecin », « Cancer(s) dans l'entourage », « Croyances hypocondriaques ». Six facteurs motivationnels barrières ont également été révélés : « Absence de cancer dans l'entourage », « Angoisses », « Douleur physique et morale », « Difficultés spatio-temporelles », « Manque d'informations », « Aspiration à la liberté ». La fréquence de réalisation des mammographies est associée positivement à l'âge, au nombre d'enfant(s), au facteur motivationnel « Habituation » et négativement aux facteurs motivationnels « Difficultés spatio-temporelles », « Douleur physique et morale » et « Manque d'informations ». L'âge et le facteur « Habituation » avaient un effet prédictif positif sur la fréquence mammographique tandis que le facteur « Difficultés spatio-temporelles » avait un effet prédictif négatif.</p>

	Conclusion : Cette étude offre une meilleure compréhension des motifs qui poussent les femmes à accepter ou à refuser la réalisation de cet examen. Elle peut être utile à la profession médicale et plus largement au champ de la santé publique.
Keywords:	Mammography; Breast cancer; Motive; Reversal theory
Secondary Keywords:	Mammographie; Cancer du sein; Motif; Théorie du renversement
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Réaliser une mammographie : Inventaire des motifs.

Perform a mammography: Motives' inventory.

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To undergo a mammography : an inventory of motives.

This study examines the motives of women for agreeing or refusing to have a mammogram. Three hundred and ten participants were recruited. Two questionnaires listing the motives for undergoing or refusing to undergo a mammogram were developed. Intolerance of uncertainty, worry, anxiety, personality were respectively rated by: EII, QIPS, GAD-7, BHI-24. Seven facilitators were interpreted within the framework of Reversal Theory: “Interest of early diagnosis”, “Quality of care”, “Habit”, “Collectivist perspective”, “Following the doctor's advice”, “Cancer(s) in entourage”, “Hypochondriac beliefs”. Six barriers were revealed: “Absence of cancer in entourage”, “Anxiety”, “Physical and moral pain”, “Lack of information”, “Spatiotemporal difficulties”, “Aspiration for freedom”. The frequency of mammography was positively linked to the age, number of children, “Habit”, and negatively to “Physical and moral pain”, “Lack of information” and “Spatiotemporal difficulties”. Age and “Habit” had a positive effect on the frequency of screening while the “Spatiotemporal difficulties” had a negative effect.

Keywords: Mammography; Breast cancer; Motive; Reversal theory

Résumé :

Introduction : Cette étude examine les motifs des femmes à accepter ou refuser la réalisation d'une mammographie. Elle investigate également les liens entre les facteurs motivationnels, l'âge, le nombre d'enfant(s), l'intolérance à l'incertitude, l'inquiétude, l'anxiété, la personnalité et la fréquence de réalisation des mammographies.

Méthode : Trois-cent-dix participantes ont été recrutées. Deux questionnaires répertoriant les motifs à accepter et à refuser la réalisation d'une mammographie ont été élaborés grâce aux données de la littérature et à des entretiens semi-directifs. L'intolérance à l'incertitude, l'inquiétude, l'anxiété et la personnalité ont été respectivement évaluées par l'EII, le QIPS, le GAD-7 et le BHI-24. L'âge, le nombre d'enfant(s) ainsi que la fréquence de réalisation des mammographies ont également été renseignés.

Résultat : Sept facteurs motivationnels facilitateurs ont été mis en lumière et interprétés au regard de la Théorie du Renversement : « Intérêt du diagnostic précoce », « Qualité de la prise en charge », « Habituation », « Perspective collectiviste », « Suivre l'avis du médecin », «

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Cancer(s) dans l'entourage », « Croyances hypocondriaques ». Six facteurs motivationnels barrières ont également été révélés : « Absence de cancer dans l'entourage », «angoisses », « Douleur physique et morale », « Difficultés spatio-temporelles », « Manque d'informations », « Aspiration à la liberté ». La fréquence de réalisation des mammographies est associée positivement à l'âge, au nombre d'enfant(s), au facteur motivationnel « Habitude » et négativement aux facteurs motivationnels « Difficultés spatio-temporelles », « Douleur physique et morale » et « Manque d'informations ». L'âge et le facteur « Habitude » avaient un effet prédictif positif sur la fréquence mammographique tandis que le facteur « Difficultés spatio-temporelles » avait un effet prédictif négatif.

Conclusion : Cette étude offre une meilleure compréhension des motifs qui poussent les femmes à accepter ou à refuser la réalisation de cet examen. Elle peut être utile à la profession médicale et plus largement au champ de la santé publique.

Mots clés : Mammographie; Cancer du sein; Motif; Théorie du renversement

Introduction

In France, Europe and the United States, breast cancer is the most common cancer in women. It is also the one with the highest mortality rate (17.9% of female cancer deaths in France) (Jehannin Ligier et al., 2017). The Organized Screening (OS) program for breast cancer became widespread in France in 2004 with the following objectives: (a) lowering the specific mortality rate for breast cancer, (b) reducing the recourse to mastectomy, and (c) decreasing the incidence of late-stage breast cancer (Lousdal et al., 2016). Mammography screening is secondary prevention: it aims to intervene early in order to improve the progression of breast cancer. Since the work of Halsted, it has often been accepted that the smaller and the earlier this cancer is treated, the more curable it is. According to the National Cancer Institute (INCa, 2013), OS has made it possible to reduce specific mortality from breast cancer by 15 to 21% worldwide.

1 The question of breast cancer screening by mammography is nevertheless
2 controversial. The main criticisms targeting OS are the following: (a) the incidence of breast
3 cancer has increased since its introduction, (b) the phenomenon of overdiagnosis is considered
4 to be underestimated by some, (c) stabilization (not a decrease) of the advanced stages has
5 been observed and finally, (d) the regions where screening is the most intense are not
6 associated with a low mortality rate specific to breast cancer (Autier and Boniol, 2018). Other
7 negative repercussions linked to the examination are reported such as (e) irradiation (Yaffe
8 and Mainprize, 2011), (f) the painful aspect of the mammogram, (g) the psychological impact
9 (anxiety, depression), and (h) the occurrence of false positives and therefore the
10 implementation of unnecessary treatments and/or invasive procedures (Gøtzsche and
11 Jørgensen, 2013).

12 In France, the OS program recommends that women aged 50 to 74 should have a
13 mammogram every two years. However, the level of participation has never managed to reach
14 the 70% coverage rate targeted by the cancer plan (INCa, 2014) and has even been decreasing
15 in recent years. The participation rate fell from 52.7% (peak in 2012) to 50.3% in 2018. Note
16 that mammography screening is not limited to this age group. Thus, Individual Screening (IS)
17 appears usual from the age of 40 in France (Haute Autorité de la Santé [HAS], 2013). Women
18 under 40 who are worried about having breast cancer or have a family history may also decide
19 to have a mammogram (Aquaviva et al., 2005).

20 Women's attitude to this test appears to depend on a multitude of factors. Some are
21 seen as facilitators, others as barriers (Püschel et al., 2009). Among the facilitating factors,
22 one can mention: (a) the place of perceived control in health (i.e., individuals attribute the
23 health events they experience to an internal or external causality) (Epstein, 2014), (b)
24 personality traits such as conscientiousness (Siegler and Costa, 1994) or type A personality
25 traits (i.e., personality traits defined by competitiveness, sense of urgency and hostility, but
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1 also associated with Consciousness and problem-centered coping strategies) (Ramanaiah et
2 al., 1997), (c) worry about cancer (Consedine et al., 2004) , and (d) the perceived risk of
3 having cancer (Ferrat et al., 2013).
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7 Among the barrier factors, one can mention: (a) fear of disease in general (Lostao et
8 al., 2001), (b) fatalism (Molaei-Zardanjani et al., 2019), (c) shame (Püschel et al., 2009), (d)
9 personality traits such as emotivity (Savabi Esfahani et al., 2018) or lack of openness (Siegler
10 and Costa, 1994), (e) fear of pain (Kalecinski et al., 2015; Lecompte, 2018), (f) the absence of
11 a family history of breast cancer (Duport et al., 2005), and (g) the fact of having children
12 (Savabi-Esfahani et al., 2018).
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22 *Motives for agreeing or refusing to have a mammogram*

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26 Few studies have focused on the motives for agreeing or refusing to undergo mammography
27 screening. Qualitative studies have shown that the motives given for undergoing
28 mammography screening were related to fear of disease, a desire to control one's health, the
29 influence of breast cancer experiences in others and recommendations from healthcare
30 professionals (Ferrat et al., 2013; Nekhlyudov et al., 2003). The motives given for not having
31 the exam related to fear, low priority given to health issues, traumatic experience of
32 mammograms, worry about ionizing radiation, and the insensitive attitude of radiologists
33 (Kalecinski et al., 2015).
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46 Quantitative studies have shown that the reasons given for engaging in mammography
47 screening were related to fear of breast cancer, an overestimation of the risk of suffering from
48 it, doctor's recommendations and wanting to take care of one's health. The reasons given for
49 not undergoing the examination were related to the lack of time, a fatalistic attitude in the
50 event of a positive diagnosis, or increased risk of invasive procedures linked to this screening
51 (Duport et al., 2005; Rakowski et al., 1992).
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The present study

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3 The specific determinants of having or refusing a mammogram have been extensively studied,
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5 but only a few studies have looked at the motives reported by women. Apter's Reversal
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7 Theory (RT) (Apter, 2001) is a motivational theory that offers the possibility of bringing
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9 together and synthesizing the available scientific data and of structuring them around large
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11 intelligible factors (Kpanake et al., 2010; Makris & Mullet, 2009). In addition, exploring a
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13 research theme through the lens of this theory offers the resources and the perspective
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15 necessary to take into account reasons that have sometimes never been examined before
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20 (Mullet et al., 2014).
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23 RT considers that motives are dynamic and fluctuating entities influencing the way
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25 that humans engage with their environment. Apter (2001) identified ten motivational states
26
27 divided into four domains: 1) Telic and Paratelic in the domain of Way-Goals; 2) Conformist
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29 and Negativist in the field of Rules; 3) Mastery and Sympathy in the field of Transactions; 4)
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31 Autocentric, Intra-autic, Allocentric and Pro-autic in the field of Relations.
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35 The *Telic* state is goal-oriented. For example, a possible Telic motive in connection
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37 with the refusal to have a mammogram could be: "X-rays are harmful to health". The
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39 *Paratelic* state pays attention to pleasant behavior in the present moment. In the *Conformist*
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41 state, rules determine the way in which behaviors are ordered, while the *Negativist* state sees
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43 the rules as restrictions and seeks to oppose them. The *Mastery* state sees the transaction as a
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45 way to take or, conversely, to leave, while the *Sympathy* state considers the transaction as a
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47 way to give or receive. The *Autocentric* state aspires to be the center of the interests and
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49 concerns of others. The *Intra-autic* state is attentive to its own interests and concerns. The
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51 *Allocentric* state is attentive to the needs and interests of others. Finally, the *Pro-autic* state
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2 Thus, in each domain we systematically find two or four opposing motivational states
3 of which only one can be active at the same time. On the other hand, several domains can be
4 activated simultaneously: combinations between a state of the domain of Transactions and a
5 state of the domain of Relations are particularly frequent (e.g., Allocentric / Mastery or
6 Autocentric / Sympathy) (Apter, 2007). In everyday life, under the influence of various
7 factors, constant shifts called “reversals” can occur from one motivational state to another
8 within the same domain.
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11 The objectives of this research consisted in (a) interpreting the motivational factors
12 inventoried with regard to the dimensions of RT and identifying two factor structures specific
13 to the motives for agreeing and refusing to have a mammogram, (b) exploring whether the
14 motivational factors are linked to the frequency of having mammograms, and beyond, the
15 demographic and personality characteristics such as: age, number of children, intolerance of
16 uncertainty, anxiety, anxiety, and personality traits. Anxiety related to mammography has
17 often been invoked in the context of the disease, but it has never been measured as an
18 individual variable in its own right.
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21 Since, to our knowledge, no study has investigated the motives for consenting to or
22 refusing mammography through the lens of RT, we investigated how the reasons for agreeing
23 or refusing to have a mammogram would organise themselves around the ten motivational
24 states of RT. We also wondered whether there were relationships between intolerance of
25 uncertainty, worry, anxiety and the frequency of screening.
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27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 **Method**

50 51 52 53 *Participants*

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56 Four hundred and seventy women were recruited in France by word of mouth, associations,
57 social networks and a call for volunteers within Toulouse Jean-Jaurès University. Three
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1 hundred and ten of them agreed to take part (refusal rate of 34%). The participants were
2 between 18 to 92 years old ($M = 48.92$; $SD = 13.95$), with the following age-group
3
4 distribution: 28 participants were 18 to 29 years old (9%), 49 were 30 to 40 years old (16%),
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6 74 were 41 to 50 years old (24%), 112 were 51 to 63 years old (36%), 36 were 64 to 74 years
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8 old (12%), 7 were 75 to 90 years old (2%), and 4 did not specify their age (1%).
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12 In our sample, 66% of the participants ($n = 205$) had a family history of breast cancer.
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14 Sixty-nine percent of participants reported having children ($n = 212$): 23% had 1 ($n = 69$),
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16 31% had 2 ($n = 96$), 15% had 3 or more ($n = 47$), 18% had not ($n = 56$) and 13% did not
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18 provide this information ($n = 42$). Out of the entire sample, 80% of participants had already
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20 had at least one mammogram ($n = 248$), 18% had never had one ($n = 57$) and 2% did not wish
21
22 to disclose this information ($n = 5$). In addition, 20% of the participants had already refused to
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24 have this examination ($n = 63$), 68% had never refused to have it ($n = 209$) and 12% did not
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26 provide this information ($n = 38$).
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31 *Material*

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36 Two questionnaires were constructed based on the motives identified in the literature and
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38 through the completion of a pre-survey.
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40 *Pre-survey*

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43 The objective of the pre-survey was to identify, through semi-structured interviews, the
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45 motives that led women to agree or refuse to have a mammogram. This procedure made it
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47 possible to inventory a large number of motivational factors, some of which have been little
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49 studied in the literature. Twelve participants, more or less favorable to mammographic
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51 screening, aged 25 to 61, freely agreed to participate. Four healthcare professionals also took
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53 part in this pre-survey, with a view to varying the data sources. Semi-structured interviews
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55 lasting an average of 30 minutes were carried out. They were all recorded, transcribed and
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57 then analysed. Content analyses were carried out on the entire corpus and several dimensions
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1 emerged such as lack of information, need to be reassured, the phenomenon of habit, social
2 influences, mistrust, opposition to medicine or to injunctions, desire to take preventive action
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4 or verify, desire to take care of oneself or to reassure one's entourage, dehumanization of care,
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6 fear of cancer, painful aspect of the examination, collectivist perspective or even
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8 identification with sick or healthy relatives. All of the motives identified during this pre-
9
10 survey were interpreted with regard to the dimensions of RT and transposed into items in
11
12 order to develop two questionnaires.
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16 17 18 *Survey* 19 20

21 The first questionnaire listed 105 facilitating motives and the second 115 barrier motives.

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23 Each item started out the same way: *“One of the reasons that would drive me to have a*
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25 *mammogram is that...”* or *“One of the reasons that would drive me to refuse to have a*
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27 *mammogram is that...”*. These repetitions allow the respondent to adopt an open attitude
28
29 towards these motives. Too often, we tend to consider that to one action corresponds one
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31 motive, and only one. All theoretically possible motivational states of RT were represented in
32
33 each of the two questionnaires. To answer each item, the participants positioned themselves
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35 on an 8-point response scale (1-8) ranging from “strongly disagree” on the left to “strongly
36
37 agree” on the right. Four additional tools were also used: the Uncertainty Intolerance Scale
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39 (EII) (Freeston et al., 1994), the Penn State Worry Questionnaire (PSWQ) (Meyer et al.,
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41 1990), the General Anxiety Disorder 7 (GAD-7) (Spitzer et al., 2006), and the 24-item Brief
42
43 HEXACO Inventory (BHI) (De Vries, 2013). Lastly, a questionnaire to collect socio-
44
45 demographic data as well as the frequency of mammography screening was included in the
46
47 research protocol. To assess the latter variable, participants had to answer the following
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49 question “How often do you have a mammogram?” by positioning themselves on a 7-point
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51 Likert scale (“never”, “every 8 to 10 years and more”, “every 5 to 7 years”, “every 4 years”,
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53 “every 3 years”, “Every 2 years”, “once a year”).
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Procedure

The participants were asked to read an information sheet and then to answer the questionnaires in a quiet public place or at their home. Both paper and online versions were made available to them. The total test lasted on average 45 minutes. In order to limit the order effect, half of the participants answered first the questionnaire listing the facilitating motives and then the questionnaire listing the barrier motives. The second half of the sample responded in reverse order.

This research received a favorable notification from a Research Ethics Committee (CER).

Results

An exploratory factor analysis with principal component extraction was carried out on the 105 facilitating patterns using Statistica 12 software, on a first part of the sample ($n = 168$). In the scree test, seven factors with eigenvalues between 5.75 and 1.19 and explaining 65% of the total variance were observed. This solution was chosen and was subjected to a standardized VARIMAX rotation. Items that were complex or had too low saturations were gradually removed until the final model was obtained.

The first factor called “Interest of early diagnosis” explained 10% of the variance and referred to the Telic motivational state of RT. It was named thus because its items expressed the positive consequences linked to early diagnosis. The mean score of the items composing it was $M = 7.18$ ($SD = 1.25$). The second factor explained 10% of the variance and referred to the combination of Sympathy/Autocentric RT motivational states. It was called “Quality of care” because its items expressed the importance for women that radiologists should have technical but also interpersonal skills. The mean score of the items composing it was $M = 5.38$ ($SD = 1.92$).

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The third factor explained 11% of the variance and referred to the Conformism state of RT. It was called “Habit” because its items expressed how mammography could become, over time, a full-fledged health habit. The mean score of the items composing it was $M = 4.41$ ($SD = 2.12$). The fourth factor explained 9% of the variance and referred to the Conformism state of RT. It was called the “Collectivist Perspective” because its items expressed an aspiration to undergo a mammogram linked to collective interest. The mean score of the items composing it was $M = 2.50$ ($SD = 1.63$).

The fifth factor explained 9% of the variance and referred to the combination of Mastery/Allocentric RT motivational states. It was called “Follow the doctor's advice” because its items expressed the influence of the doctor's advice on women's attitudes towards mammography. The mean score of the items composing it was $M = 6.20$ ($SD = 1.52$). The sixth factor explained 7% of the variance and referred to the Pro-autic state of RT. It was called “Cancer(s) in the entourage” because its items expressed the fact that cancer experiences in the near environment could be lived by proxy. The mean score of the items composing it was $M = 5.13$ ($SD = 2.65$). Finally, the seventh factor explained 9% of the variance and referred to the Intra-autic state of RT. It was called “Hypochondriac Beliefs” because its items expressed hypochondriac fears. The mean score of the items composing it was $M = 4.13$ ($SD = 1.83$).

The same procedure was applied to the 115 barrier motives. A six-factor solution presenting eigenvalues between 6.87 and 1.12 and explaining 70% of the variance was retained. The first factor explained 13% of the variance and referred to the Pro-autic state of RT. It was called “Absence of cancer in the entourage” because its items expressed immersion in an environment where this pathology does not exist (identification with a healthy entourage). The mean score of the items composing it was $M = 1.91$ ($SD = 1.45$).

1 The second factor explained 14% of the variance and referred to the combination of
2 Intra-autic/Mastery RT motivational states. It was called “Anxiety” because its items
3
4 expressed apprehension specific to the discovery of breast cancer and the lack of control over
5
6 its consequences. The mean score of the items composing it was $M = 2.99$ ($SD = 2.03$). The
7
8 third factor explained 13% of the variance and referred to the combination of
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10 Allocentric/Mastery RT motivational states. It was called “Physical and Moral Pain” because
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12 its items expressed the physiological and psychological impact that the exam could have on
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14 women. The mean score of the items composing it was $M = 3.17$ ($SD = 1.94$).
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19 The fourth factor explained 10% of the variance and referred to the intra-autic
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21 motivational state of RT. It was called “Spatio-temporal difficulties” because its items
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23 expressed practical constraints such as lack of time or accessibility. The mean score of the
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25 items composing it was $M = 2.46$ ($SD = 1.76$). The fifth factor explained 11% of the variance
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27 and referred to the Paratelic state of RT. It was called “Lack of information” because its items
28
29 expressed the problem of the insufficiency of the information provided, questioning the
30
31 practice of mammography itself. The mean score of the items composing it was $M = 3.46$ (SD
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33 $= 1.90$). Finally, the sixth and final factor explained 9% of the variance and referred to the
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35 negativist state of the RT. It was called “Aspiration for Freedom” because its items expressed
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37 opposition to being pressured into doing a health exam. The average score of the items
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39 composing it was $M = 1.74$ ($SD = 1.09$).
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47 Confirmatory factor analyses were performed on a second part of the sample ($n = 126$). A first
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49 confirmatory factor analysis was carried out on the motives for undergoing a mammogram
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51 using Statistica 12 software (see Table 1). Of the 26 items that emerged from the exploratory
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53 factor analysis, 22 were retained for confirmatory factor analysis. Four items were removed
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55 because they saturated less than the other items on their dimension. The GFI value was .84;
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57 the CFI value was .91; the RMSAE value was .05 [.00-.08]; the χ^2/Df ratio (265.55/188)
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1 was 1.41, the p-value was .001. The fit index of the data model confirmed that this solution of
2 the motives for having a mammogram in seven factors was satisfactory. The internal
3 consistency of the seven patterns retained was generally good (respectively from I to VII,
4 $\alpha = .80, .76, .78, .74, .70, .69, .70$).

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10 A second confirmatory factor analysis was carried out on the motives for refusing to
11 have a mammogram (see Table 2). To conduct this analysis, all the items that emerged from
12 the exploratory analysis were kept. The GFI value was .80; the CFI value was .87; the
13 RMSAE value was .08 [.00-.08]; the Chi²/Df ratio (406.81/194) was 2.10, the p-value was
14 .001. Although this model was slightly less satisfactory, it was still acceptable since the values
15 of the indices approached the significance thresholds and the internal consistency of the
16 factors composing it was excellent (respectively from I to VI, $\alpha = .87, .86, .90, .75, .87, .81$).

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31 [Insert here Table 2]

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35 On this same sample ($n = 126$), bivariate correlation analyses were then carried out between
36 motivational factors, variables such as age, number of children, intolerance to uncertainty,
37 worry, anxiety, personality traits and mammogram frequency (see Table 3). The frequency of
38 mammography screening was strongly associated with age $r = .64, p < .01$, with the “Habit”
39 factor, $r = .55, p < .01$, and more moderately with the number of children(s), $r = .25, p < .01$.
40 It was negatively associated with the factors “Spatio-temporal difficulties”, $r = -.40, p < .01$,
41 “Physical and moral pain”, $r = -.31, p < .01$, and “Lack of information”, $r = -.25, p < .01$. In
42 other words, the older a woman was, had a high number of children, was accustomed to
43 mammography, had little regard for spatio-temporal constraints, perceived this examination
44 less as physically and psychologically painful, had less the feeling of lacking information, the
45 more frequently she underwent mammograms. No personality trait was significantly
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1 associated with the frequency of mammogram screening. No association was found between
2 intolerance of uncertainty, worry, anxiety and frequency of the exam.
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5 A series of regression analyses was carried out on the variable “Frequency of mammogram
6 screening”. Intolerance to uncertainty, worry and anxiety were tested first and explained 4%
7 of the variance ($F(1,114) = 4.24, p = 0.04$): only worry was significant ($\beta = -0.19$).
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10 Personality traits were tested second and explained 7% of the variance ($F(2,113) = 4.21, p =$
11 0.01): only the Consciousness trait was significant ($\beta = -0.23$). Sociodemographic
12 characteristics were tested third and explained 42% of the variance ($F(2,113) = 40.34, p <$
13 0.01): only age was significant ($\beta = 0.61$). Motivational factors were tested fourth and
14 explained 38% of the variance ($F(3, 112) = 23.01, p < 0.01$): the factors “Habit” ($\beta = 0.48$)
15 and “Spatio-temporal difficulties” ($\beta = -0.31$) were the only significant ones.
16
17

18 A final step-by-step regression analysis was performed on the predictors integrated
19 simultaneously. Age ($\beta = 0.46$) as well as the factors “Habit” ($\beta = 0.30$) and “Spatio-temporal
20 difficulties” ($\beta = -0.21$) were related to the frequency of mammogram screening. These
21 variables explained 54% of the variance ($F(3, 112) = 43.66, p < 0.01$). Their high intensities
22 neutralized the low weight of the “Worries” and “Consciousness” predictors that emerged
23 during the first regression analyses. Thus, being older, being more sensitive to the argument
24 that mammography is common practice and being less sensitive to the motive inherent in
25 space-time constraints, predicted a regular frequency of undertaking this examination.
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28 **Discussion**

29 The first objective of this study was to identify the motivational barriers and facilitators to
30 undergoing a mammogram and to interpret them with respect to RT.
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33 The motives in favour of screening appeal, in the order of importance given by women on the
34 response scale, to the Telic state (“Interest of early diagnosis”), the combination of the
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1 Allocentric/Mastery states (“Following the doctor's advice”), the combination of the
2 Sympathy/Autocentric states (“Quality of care”), the Pro-autic state (“Cancer in the
3 entourage”), the Conformism state (“Habit”), the Intra-autic state (“Hypochondriac Beliefs”)
4 and the Conformism state again (“Collectivist Perspective”). The motives for refusal appeal,
5 in the order of importance given by the women on the response scale, to the Paratelic state
6 (“Lack of information”), the combination of the Allocentric/Mastery states (“Physical and
7 moral pain”), the combination of the Intra-autic/Mastery states (“Anxiety”), the Intra-autic
8 state (“Spatio-temporal difficulties”), the Pro-autic state (“Absence of cancer in the
9 entourage”) and the Negativist state (“Aspiration for freedom”). Most of the patterns
10 identified in this research are consistent with the evidence in the literature, but RT has
11 allowed us to deepen our understanding.
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26 The factors “Following the doctor's advice” and “Quality of care” already highlighted
27 elsewhere (Domenighetti et al., 2003; Lecompte, 2018) indicate that while women generally
28 prefer the doctor to have control of their health, they aspire to control the behavior of the
29 technician performing the examination and in particular wish it to be sympathetic and human.
30 The factor “Cancer(s) in the entourage” has also been mentioned in the literature (Duport et
31 al., 2005; Ferrat et al., 2013; Savabi Esfahani et al., 2018). It points to the fact that the
32 experience of breast cancer in the entourage can be lived by proxy – or at least that an
33 identification process can take place – which makes it easier to decide to have a mammogram.
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46 The factor “Hypochondriac beliefs” emerged in our study as a facilitating motive
47 whereas the work of Lostao et al. (2001) suggested that having hypochondriac beliefs was
48 associated with a decrease in mammography practice. Our understanding of the motives for
49 doing this exam, which revolve around fear of disease and the anxieties inherent in cancer,
50 seems tenuous. It is true that in individuals with a form of hypochondria, there is complacency
51 with regard to medical exploration (Lionet and Tiberghien, 2018).
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The factor “Interest of early diagnosis” is one of the main arguments used by health professionals (Perry et al., 2007). The goal to be achieved by performing a mammogram is therefore to detect cancer as early as possible in order to benefit from the best care. Finally, the “Habit” and “Collectivist Perspective” factors are motives which have been mentioned very little in the literature dealing with mammography. Regarding the “Habit” factor, it appears that over time mammography becomes a mechanical behavior until it evolves into a health habit. Regarding the factor “Collectivist perspective”, the 100% coverage of mammography by Health Insurance certainly reinforces the idea that this examination is a gift offered by national solidarity in order to serve the common interest – which undoubtedly directs women towards a more collectivist than individual positioning. This is consistent with the results of the study by Domenighetti et al. (2003) reporting that women residing in England and Italy (countries where the health service is public) overestimate the benefits of screening compared to women residing in Switzerland and United-States (countries where the health service is private).

Among the six motivational barriers identified, all have been cited in the literature. Note that few of them report a total rejection of mammography screening and that, judging from the average responses of the participants, the reasons for refusal are much weaker than the reasons for acceptance. However, these motivational factors are still good indicators for the medical profession and the preventive health field. The factor “Absence of cancer(s) in the entourage” shows that not being around women with breast cancer probably induces a feeling of less vulnerability (Duport et al., 2005; Ferrat et al., 2013; Savabi Esfahani et al., 2018).

The “Anxiety” factor has also been addressed in the literature (Consedine et al., 2004; Ferrat et al., 2013). It appears here to be a barrier motif which contradicts the results of Consedine et al. (2004) stating that concerns about cancer are positively associated with mammography practice. The terminologies used to describe the anxiety associated with

1 mammography vary from study to study, which no doubt contributes to maintaining these
2 discrepancies in results. In our research, RT explains that barrier anxiety refers to mental
3 insecurity related to the lack of control over breast cancer and its consequences. Thus, the
4 subject's concerns center on the inability to control future unpleasant events in the event of a
5 positive diagnosis. The "Physical and moral pain" factor has also been highlighted in previous
6 studies (Kalecinski et al., 2015; Lecompte, 2018). However, RT enriches this knowledge by
7 specifying that the difficulty inherent in physical and moral pain is, in part, due to the fact of
8 not being able to control the degree of interest shown by health professionals in the patient
9 during the examination.
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12 The "Spatio-temporal difficulties" factor has already been noted in several studies
13 (Duport et al., 2005; ORS, 2001). It essentially refers to the issue of time management or the
14 difficulties inherent in making an appointment. The "Lack of information" factor has often
15 been deplored in the literature (Cases et al., 2016; Hersch et al., 2016). It is suggested that the
16 goal that women seek to achieve by refusing to have a mammogram is to protect themselves
17 from an examination they feel suspicious of due to the vagueness of the information provided.
18 The "Aspiration for freedom" factor has also been mentioned in the literature, but succinctly
19 and only in a few studies (Kalecinski et al., 2015; Lecompte, 2018). In this factor, the rule is
20 experienced as a restriction which women seek to oppose by adopting an unconventional
21 attitude in order to feel free.
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24 The second objective of this study was to examine whether motivational factors, and variables
25 such as age, number of children, intolerance of uncertainty, worry, anxiety, and personality
26 were linked to the frequency with which mammograms were performed. First, intolerance of
27 uncertainty, worry and anxiety were not related in our study to the frequency of having
28 mammograms (neither were the motivational factors "Anxiety" and "Hypochondriac
29 Beliefs"). Thus, although the literature has been very interested in this type of variable in this
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1 particular context, their links with mammographic frequency remain insignificant in our
2 study. Personality traits are also unrelated to how often mammograms are performed. The
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4 observations of Siegler and Costa (1994) about a positive effect of the Awareness factor and a
5
6 negative effect of the Openness factor on the decision to undergo mammography are therefore
7
8 not verified here. Regarding socio-demographic characteristics, it was observed that the more
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10 children the women have, the higher the frequency of having mammograms. In addition, it
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12 was also observed that the older women get, the more frequently they tend to have this exam
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14 – which appears consistent with the age groups targeted by breast cancer screening. It
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16 therefore appears that women's attitudes towards mammography are not linear and are likely
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18 to vary over time. RT claims that human motivations are subject to fluctuations. In addition,
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20 four motivational factors – “Habit”, “Physical and moral pain”, “Spatio-temporal difficulties”
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22 and “Lack of information” – maintain a relationship with the frequency of screening. The
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24 factors “Spatio-temporal difficulties” and “Physical and moral pain” involve transactional
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26 emotions (Apter, 2001). Thus, the frequency of having a mammogram is negatively linked to
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28 individual concerns which nevertheless form part of the social universe of women. They focus
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30 their attention on their personal interests and on their desire to be recognized for who they are
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32 – that is, full individuals who must be distinguished from others. In addition, the factors
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34 “Habit” and “Lack of information” involve somatic emotions (Apter, 2001). Thus,
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36 mammographic frequency is positively linked to internal feelings such as the desire to be
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38 integrated into the community by adopting the majority behavior. It is also negatively linked
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40 to internal feelings such as trying to protect oneself from an exam for which there is
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42 insufficient information.
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52 The question then arises as to how these elements of knowledge can be discussed in the
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54 medical consultation. And how can they help initiate new thinking in terms of breast cancer
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56 screening policy? It seems necessary for health actors (ministry and doctors included) to
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1 provide women with clear and fair information about the benefits and risks of mammography.
2 Screening policies should certainly value informed choice rather than maximizing the use of
3 mammography (Hersch et al., 2015). In addition, the physician can listen to and understand
4 women's need for control and freedom, while being careful not to clumsily adopt a defensive
5 attitude that may be counterproductive. It could be interesting in future research to question
6 how physicians are emotionally affected by the attitude and arguments of reluctant women.
7 Better understanding the emotions at play during this type of consultation can help to
8 reorganize the framework and the content of the doctor/patient exchanges. In addition,
9 detecting the health habits of women resistant to mammography is also crucial.
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23 **Limits**

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26 This study has several limitations. First, the research protocol was relatively substantial:
27 cognitive fatigue may have appeared at the end of the test. Second, this study had a virtual
28 nature: it is possible that in a real situation, the motives given are not the same as in a
29 hypothetical situation (especially for the women who have never had a mammogram)
30 (Coniassse Brioude, 2011). Finally, third, the sample did not appear to be fully representative.
31 It was mainly made up of women who had already agreed to have at least one mammogram
32 (those refusing to have one mostly refused to participate in the study). According to the work
33 of Mulot (2009) on the wearing of condoms “the answers given in the context of quantitative
34 surveys correspond to the official public register, that of the norm, and do not always reflect
35 the reality of effective behaviour”. We are then faced with a paradox: how to readjust large-
36 scale public health policies such as organized screening if one is unable to consider the
37 opinion of those who are the most resistant? Doesn't that make the turnout problem insoluble?
38 It might be interesting to understand why women opposed to mammography also oppose
39 research into it. Is this an expression of a broader mistrust that needs to be further explored?
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Table 1

Results of the confirmatory factor analysis concerning the motives for agreeing to have a mammogram

One of the reasons that would drive me to have a mammogram is that...	Factors							M	SD
	I	II	III	IV	V	VI	VII		
... early diagnosis could increase the chances of recovery.	.83							7.36	1.52
... early diagnosis could allow better care	.78							7.49	1.32
... I want us to be able to detect a tumor as soon as possible.	.73							7.35	1.62
... early diagnosis could allow less burdensome treatment.	.69							7.22	1.42
... the radiology center team is friendly.		.87						4.75	2.51
... the radiology center team is human.		.79						6.13	2.23
... I've got into the habit of doing this exam.			.83					5.33	2.81
... as a woman, I am used to breast examinations.			.76					5.58	2.38
... It is a common exam for me.			.73					4.57	2.58
... I tolerate the pain of the exam well.			.64					4.23	2.66
... I would feel guilty about the public money that would be spent is I was diagnosed with cancer late.				.76				2.31	2.01
... I would feel guilty for refusing what social security offers me.				.75				2.82	2.31
... I want to get the sympathy of my relatives who tell me to do it.				.71				2.08	1.72
... I perform this exam in a collective interest, out of civic duty.				.60	.32			3.06	2.23
... my gynecologist encouraged me to do so.	.30				.79			6.74	1.82
... my doctor convinced me.					.77			5.99	2.19
... I have a family history of breast cancer.						.85		5.91	2.88
... relatives have had breast cancer.						.81		5.93	2.65
... the possibility of having breast cancer regularly scares me.							.77	4.99	2.45
... I often feel like I'm going to get sick.		.35					.67	2.67	1.88
... even though my doctor thinks I have nothing, I still have some doubts.					.41		.63	5.15	2.67
... I fear dying and leaving my children, my family.				.36			.56	4.76	2.44
M	7.34	5.44	4.92	2.56	6.36	5.92	4.38		
SD	1.23	2.14	2.01	1.57	1.76	2.42	1.73		
Cronbach alpha	.80	.76	.78	.74	.70	.69	.70		

Note. I, Interest of early diagnosis; II, Quality of care; III, Habit; IV, Collectivist perspective; V, Following the doctor's advice; VI, Cancer(s) in entourage; VII, Hypochondriac beliefs

Table 2

Results of the confirmatory factor analysis concerning the motives for refusing to have a mammogram

One of the reasons that would drive me to refuse to have a mammogram is that...	Factors						M	SD
	I	II	III	IV	V	VI		
... we never talk about cancer in my closed environment.	.79						1.68	1.57
... none of my relatives have had breast cancer.	.79						1.43	1.39
... no one does this exam in my family.	.78						1.41	1.33
... I have no family history of breast cancer.	.78					.31	1.71	1.72
... I am worried about waiting for the exam results.		.79					2.96	2.43
... this exam makes me think of my own death.		.78					2.46	2.25
... I am afraid I won't know how to deal with it if I find out that I have cancer.		.77					3.04	2.44
... I don't want cancer to be found because I won't be able to live normally.		.59	.33				2.16	2.08
... I find the exam violent.			.88				3.28	2.45
... I am afraid of suffering during the exam, afraid of pain.			.84				2.88	2.46
... I find the examination dehumanizing (loss of dignity).			.74				2.52	2.22
... radiologists have no regard for the pain experienced during the exam.			.71	.31			3.48	2.22
... I have a lot of difficulty making an appointment (medical or otherwise).				.82			2.11	1.94
... I don't have the time.				.75			2.46	2.22
... I can't put up with having to schedule an appointment.				.70		.39	2.06	1.90
... we are only given information on why to do it, and not on why not to do it.					.78		3.40	2.54
... there is not enough information to make an informed decision.			.35		.76		3.14	2.50
... some scientific researchers question this examination.					.75	.35	3.38	2.35
... there is a lack of quantitative information on the benefits of screening.		.38			.68		3.43	2.40
... I am satisfied with myself when I resist the "injunction to do".						.79	1.71	1.63
... I don't want to encourage other people to perform this exam by doing it myself.	.38					.74	1.42	1.23
... I can't put up with others telling me what to do.						.70	1.90	1.74
<i>M</i>	1.57	2.65	3.04	2.21	3.34	1.69		
<i>SD</i>	1.34	1.93	2.12	1.65	2.07	1.38		
Cronbach alpha	.87	.86	.90	.75	.87	.81		

Note. I, Absence of cancer in entourage ; II, Anxiety ; III, Moral and physical pain ; IV, Spatio-temporal difficulties ; V, Lack of information ; VI, Aspiration to freedom