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“I Think I Do but I Don’t”: Heightened (Breast) Cancer Concern as a Function of Availability Bias

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Abstract: Background: Women report a heightened concern of (breast) cancer, relative to other chronic conditions. This experimental study investigated whether such heightened concern may be a function of availability bias. Methods: participants (N = 750; 100% female) were randomly assigned to one of two experimental conditions: in the *recall* condition, they were asked to name the health condition they feared most; in the *recognition* condition, they picked the disease they feared most out of a list of chronic conditions. Results: The probability of selecting cancer as the most frightening disease varied as a function of experimental condition $\chi^2(10) = 112.13, p < 0.001$. Participants in the recall condition were almost twice as likely to select cancer as the most frightening disease (N = 240, 59.10%) as those in the recognition condition (N = 121, 35.20%), who most frequently selected neurological diseases as the most threatening. The majority of participants believed that cancer was the disease receiving the most media attention (86.27%) (prior to the COVID-19 pandemic), and the one accounting for the highest number of deaths among Spanish females (63.50%). Conclusions: altogether, these results provide experimental evidence that availability bias may partly account for misperceptions and a heightened fear of cancer, which may narrow the scope of women’s information-seeking and health-preventive behaviors.

Keywords: cancer; cardiovascular diseases; neurological diseases; heightened concern; availability bias; young women



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1. Introduction

Chronic diseases (i.e., those that last one year or more and require ongoing medical attention or limited activities of daily living or both) [1,2] are largely responsible for Europe’s disease burden [3–5]. Around 3.9 and 2.10 million deaths from cardiovascular disease and cancer alone, respectively, were estimated to occur in 2019 [6]. With increasing population aging and improvements in the treatment and clinical management of once lethal conditions, the prevalence of chronic diseases within this region is expected to rise in the following years. To some extent, chronic conditions are the result of modifiable behaviors (e.g., smoking, physical inactivity), which, based on a vast amount of research [7–9], can be greatly influenced by the perceived level of threat posed by chronic conditions.

Risk perceptions and fear of chronic conditions are shaped by the nature of health-related information individuals are exposed to. Traditionally, health campaigns have played an essential role in providing the population with accurate health-related information [10]. Nevertheless, a substantial portion of individuals now rely on the mass media and social media for (often questionable) information about health [11,12]. This phenomenon has been perhaps most evident during the unprecedented COVID-19 infodemic (i.e., overabundance of information—some accurate and some not) [13], which created great alarm and confusion among the general population [14]. Unwanted consequences such as these, however, had been previously observed. Research conducted decades ago suggest that fear/concern

and misperceptions about chronic conditions often result from the quantity and quality of attention these receive in the media [15,16].

Some studies have observed that women report a higher fear of cancer—especially breast cancer—than of any other disease [15–17]. This cannot be attributed to epidemiological indicators alone. First, breast cancer survival rates among European women are considerably higher than that of many other types of cancer [18,19]. Second, among females from most European countries, recent estimates reveal that mortality rates of all cancer types combined are considerably lower than that of cardiovascular disease [3]. Consequently, previous research has suggested that a heightened fear of breast cancer may be largely the result of psychological, social, and cultural factors [20]. In addition to its impact on health itself, it has been suggested that breast cancer affects women’s sense of femininity and sexuality like no other type of cancer [21–23]. Further, compared to perhaps all chronic diseases, stories about breast cancer are abundant in the mass media and social media, often spreading inaccurate information highlighting the social consequences of having cancer [24,25]. Furthermore, women perceive cancer as less controllable than other chronic conditions (e.g., cardiovascular diseases) [17], which again, seems to be a function of the way different conditions are represented in the mass media and social media [26].

Fear constitutes a double-edged sword when it comes to behavior change. Fear induction has been a commonly used element in health campaigns because it can influence efforts aimed at prevention [27]. However, while fear can mobilize some people in a functional way, it can also lead to misconceptions, the overestimation of risk, and the avoidance of health-preventive practices (e.g., cancer screening) [28]. For example, several studies have found that many women overestimate their risk of being diagnosed with breast cancer and hold fatalistic beliefs about the possible consequences of being diagnosed with breast cancer [25,29,30]. Moreover, heightened concern with certain diseases (e.g., breast cancer) may shift attention away from other conditions associated with worse prognosis and/or higher incidence rates (e.g., lung cancer, cardiovascular diseases), limiting the scope of preventive behaviors [31].

This study investigated whether the salience of (breast) cancer may be a factor contributing to heightened concern, relative to other chronic conditions. Based on *availability bias* [32], “there are situations in which people assess the frequency of a class or the probability of an event by the ease with which instances or occurrences can be brought to mind”. Accordingly, women may over-estimate incidence rates of (breast) cancer and the probability of receiving a diagnosis due to the over-representation of (breast) cancer in the mass media and social media, and therefore, due to the ease with which (breast) cancer may be brought to mind. First, to our knowledge, this question has not been tested experimentally: previous studies have suggested that heightened (breast) cancer concern is associated with an overabundance of media attention, but those have relied on different methodologies. Second, to our knowledge, this specific topic of research has never been explored among Spanish women. Specifically, we assessed whether (a) cancer is the disease women fear most; (b) breast cancer is the type of cancer women fear most; and (c) the ease with which certain diseases come to mind may alter judgements about how frightening they are [32]. Based on these objectives and previous research, it was hypothesized that

1. Cancer would be most frequently reported as the condition eliciting the highest concern.
2. Breast cancer would be most frequently reported as the type of cancer eliciting the highest concern.
3. Heightened (breast) cancer concern would be a function of availability bias. That is, whether or not (breast) cancer is most frequently reported as the most frightening disease would depend on whether or not information about other chronic diseases is made available to participants.

2. Results

2.1. Preliminary Data Analyses

There were no missing values. No univariate outliers and one multivariate outlier were detected using the outlier labelling rule and Mahalanobis distance, respectively; this outlier, however, was retained in the data upon confirming that its removal did not alter the results. Statistical assumptions for Pearson’s chi-square test (i.e., independence of observations) and *t*-test (i.e., normal sampling distribution and homogeneity of variance) were, to a large extent, satisfied: the results of Levene’s test of homogeneity of variances were significant for the variable fear of injury, and therefore, group differences were in this case calculated using the Welch’s unequal variances *t*-test.

2.2. Participants

Eight-hundred and four participants were initially recruited for this study. However, the data from 54 participants allocated to the recall condition were excluded because they did not provide a clear response when asked which health condition they feared most: some of the responses were unspecific (e.g., “any condition that makes me suffer”) and some participants simply stated they “didn’t know” or were “unsure” of which condition they feared most. Therefore, the data from 750 participants were included in the analyses presented here. Participants were all female and had a mean age of 29 years, the vast majority rated their health as good or very good, and most reported no diagnosis of previous chronic conditions. Basic information on demographic characteristics and personal and family medical history, divided by group, can be found in Table 1.

Table 1. Basic information on demographic characteristics, medical history, and health behaviors.

	Recall (N = 406)		Recognition (N = 344)		<i>t</i>
	Mean	S.D.	Mean	S.D.	
Age	30.04	6.24	28.95	6.88	2.24 *
	<i>N</i>	%	<i>N</i>	%	χ^2
Gender					-
<i>Female</i>	406	100.00	344	100.10	
<i>Male</i>	0	0.00	0	0.00	
Perceived health					6.42
<i>Very good</i>	90	22.20	98	28.50	
<i>Good</i>	276	68.00	221	64.20	
<i>Fair</i>	32	7.90	23	6.70	
<i>Poor</i>	8	2.00	2	0.60	
History Dx. chronic illness (own)					1.14
<i>Yes</i>	41	10.10	27	7.80	
<i>No</i>	365	89.90	317	92.20	
History Dx. chronic illness (parents)					2.98
<i>Yes</i>	127	31.30	98	28.50	
<i>No</i>	279	68.70	244	70.90	
Smoking status					2.12
<i>Yes</i>	81.05	19.05	68	19.70	
<i>No</i>	325	80.05	276	80.30	

Table 1. *Cont.*

	Recall (N = 406)		Recognition (N = 344)		<i>t</i>
	Mean	S.D.	Mean	S.D.	
Alcohol					3.69
<i>Did not drink over past year</i>	22	5.40	28	8.10	
<i>Up to twice per week</i>	371	91.40	302	87.80	
<i>Three or more times per week</i>	13	3.20	13	3.80	
Physical activity					1.69
<i>Less than once a week</i>	145	35.70	133	38.70	
<i>Between once and three times</i>	176	43.30	133	38.70	
<i>More than three times per week</i>	85	20.90	78	22.70	
Educational level					2.07
<i>Primary school</i>	1	0.20	0	0.00	
<i>Secondary school</i>	3	0.70	3	0.90	
<i>High school or vocational training</i>	154	37.90	144	41.90	
<i>University degree</i>	248	61.10	197	57.30	
Employment status					6.55
<i>Student</i>	79	19.50	76	22.10	
<i>Unemployed</i>	35	8.60	32	9.30	
<i>Self-employed</i>	34	8.40	16	4.70	
<i>Employed part-time</i>	65	16.00	68	19.80	
<i>Employed full-time</i>	177	43.60	140	40.70	
<i>Home-maker</i>	16	3.90	12	3.50	
<i>Retired</i>	0	0.00	0	0.00	
Marital status					8.42
<i>Single</i>	215	53.00	201	58.40	
<i>Married/Common law</i>	167	41.10	124	36.10	
<i>Separated/Divorced</i>	24	5.90	16	4.70	
<i>Widowed</i>	0	0.00	3	0.90	

Note: Dx = diagnosis; S.D. = standard deviation; * *p* < 0.05.

2.3. Baseline Group Differences

No baseline group differences in fear of injury or fear of illness were observed between participants in the recall and recognition conditions (Table 2).

Table 2. Differences in between participants in the recall (N = 406) and recognition (N = 344) conditions.

	Recall		Recognition		<i>t</i>	<i>p</i>	95% C.I.	Cohen's <i>d</i>
	Mean (S.D.)	Mean (S.D.)	Scale Range					
Fear of injury	17.70 (5.15)	15.80 (4.72)	5–25		−0.28	0.778	−0.81–0.61	0.02
Fear of illness	22.35 (4.88)	22.46 (4.47)	5–30		−0.32	0.749	0.79–0.57	0.02

Note: S.D. = standard deviation; C.I. = confidence intervals.

2.4. Most Feared Health Conditions

Table 3 shows the frequency with which each disease was reported as the most frightening, taking into consideration the responses of participants in the recall condition alone. The results of the Pearson chi-square analysis were statistically significant

($\chi^2 (10) = 2160.95, p < 0.001$), indicating that there were differences between the expected and observed frequencies with which diseases were reported. Overall, cancer was the disease most frequently (N = 240) reported as the most frightening, followed by neurological conditions (N = 117). Based on the standardized residual approach [33], the differences between the expected and observed frequencies in the case of these two conditions were statistically significant (i.e., standardized residual > 2.58), indicating that they were more frequently reported than expected by chance; this was not the case of any other disease. Breast cancer was most frequently reported (N = 57) as the most frightening type of cancer.

Table 3. Frequency with which different diseases * were reported as the most frightening disease (N = 406).

	Observed N	Expected N	Std. Res
Cancer	240	40.60	31.30
<i>Mouth and oropharynx</i>	2		
<i>Stomach</i>	7		
<i>Colon</i>	13		
<i>Liver</i>	5		
<i>Pancreas</i>	28		
<i>Lung</i>	29		
<i>Skin</i>	6		
<i>Breast</i>	57		
<i>Uteri</i>	3		
<i>Ovaries</i>	6		
<i>Kidney</i>	3		
<i>Brain and nervous system</i>	33		
<i>Lymphomas</i>	1		
<i>Leukemia</i>	14		
<i>Other</i>	12		
<i>Did not specify cancer type</i>	21		
Neurological conditions	117	40.60	12.00
<i>Alzheimer's disease</i>	61		
<i>Parkinson</i>	2		
<i>Multiple sclerosis</i>	17		
<i>ALS</i>	25		
<i>Other</i>	12		
Infectious diseases	21	40.60	−3.08
<i>Meningitis</i>	1		
<i>Hepatitis</i>	1		
<i>HIV/AIDS</i>	19		
Mental and substance use disorders	11	40.60	−4.65
<i>Depressive disorders</i>	1		
<i>Schizophrenia</i>	5		
<i>Alcohol use disorders</i>	1		
<i>Did not specify</i>	4		
Diabetes mellitus	5	40.60	−5.59
Unintentional injuries	4	40.60	−5.75
Cardiovascular diseases	3	40.60	−5.90
<i>Stroke</i>	2		
<i>Other circulatory diseases</i>	1		
Musculoskeletal diseases	2	40.60	−6.06
<i>Arthritis</i>	2		
Digestive diseases	1	40.60	−6.22
<i>Crohn</i>	1		
Other	2	40.60	−6.06

Note: The Pearson's chi square test was statistically significant, $\chi^2 = 1365.18 (9), p < 0.001$. Std. Res = standardized residual; ALS = Amyotrophic Lateral Sclerosis; COPD = chronic obstructive pulmonary disease; HIV/AIDS = Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome. * The list of health conditions was constructed based on the WHO Global Health Estimates 2019 [6].

2.5. Heightened Cancer Concern as a Function of Availability Bias

Contingency table analyses revealed that there was a statistically significant association between the disease participants most frequently reported as most frightening and the experimental condition, $\chi^2(10) = 112.13, p < 0.001$. Participants in the recall condition most frequently reported cancer as the most frightening disease (N = 240, 59.10%), which almost doubled the proportion of those reporting the same in the recognition condition (N = 121, 35.20%). Based on the standardized residual approach [33], the difference between the observed and expected frequency with which participants reported cancer as the most frightening disease in both conditions was statistically significant (i.e., standardized residual > |2.58|). Participants in the recognition condition most frequently reported fearing neurological diseases the most. Detailed information about these analyses can be found in Table 4.

Table 4. Contingency table analyses of frequency with which different diseases were reported by participants as the most frightening as a function of experimental condition.

		Recall (N = 406)	Recognition (N = 344)
Cancer	Obs (Exp)	240 (195.40)	121 (165.60)
	Std. Res	3.20	−3.50
Neurological conditions	Obs (Exp)	117 (135.30)	133 (114.70)
	Std. Res	−1.60	1.70
Cardiovascular diseases	Obs (Exp)	3 (31.90)	56 (27.10)
	Std. Res	−5.10	5.60
Infectious diseases	Obs (Exp)	21 (23.80)	23 (20.20)
	Std. Res	−0.60	0.60
Mental and substance use disorders	Obs (Exp)	11 (6.00)	0 (5.00)
	Std. Res	2.10	−2.20
Respiratory diseases	Obs (Exp)	0 (3.20)	6 (2.80)
	Std. Res	−1.80	2.00
Diabetes mellitus	Obs (Exp)	5 (2.70)	0 (2.30)
	Std. Res	1.40	−1.50
Unintentional injuries	Obs (Exp)	4 (2.20)	0 (1.80)
	Std. Res	1.20	−1.40
Other	Obs (Exp)	2 (2.70)	3 (2.30)
	Std. Res	−0.40	0.50
Digestive diseases	Obs (Exp)	1 (1.6)	2 (1.4)
	Std. Res	−0.50	0.50
Musculoskeletal diseases	Obs (Exp)	2 (1.10)	0 (0.90)
	Std. Res	0.90	−1.00

Note: Pearson’s chi-square test was statistically significant, $\chi^2(10) = 112.13, p < 0.001$; Obs = observed; Exp = expected; Std. Res = standardized residual.

2.6. Media Attention and Mortality Rates

The vast majority (N = 647, 86.27%) of participants thought that cancer was the condition receiving the most attention in the mass media (prior to the COVID-19 pandemic); the responses of some of these participants referred to specific cancer types: breast (N = 132), lung (N = 16), skin (N = 4), colon (N = 1), and brain (N = 1). A minority of participants thought that several diseases other than cancer received the most media attention, most notably HIV/AIDS (N = 15), the flu (N = 10), and cardiovascular disease (N = 9). The majority of participants (N = 476, 63.50%) also believed that cancer was the disease accounting for the highest number of deaths among females, followed by cardiovascular disease (N = 191, 25.50%), Alzheimer’s disease (N = 30, 4.00%), HIV/AIDS (N = 23, 3.10%), respiratory disease (N = 22, 2.90%), and diabetes (N = 8, 1.10%).

2.7. Qualitative Data Analysis

The results of the qualitative data analyses were organized into several themes for each of the health conditions reported as most frightening by at least 5% of participants: cancer, neurological conditions, cardiovascular diseases, and HIV/AIDS. Such themes represent the specific aspects participants thought were most concerning about the diseases they reported as most frightening. The specific themes, along with verbatim quotes, can be found in Table 5.

Table 5. Themes and supporting quotes extracted from participants' responses regarding the specific aspects they found most concerning about the diseases they feared most.

Disease	Theme	Supporting Quotes
Cancer	Poor prognosis, death	<i>A slow and painful death (ID 217)</i> <i>Knowing that I may die, unable to do anything about it (ID 727)</i> <i>It's a death sentence (ID 117)</i>
	Impact on daily life, suffering	<i>The long time one can live severely impacted by cancer (ID 394)</i> <i>No longer feeling happiness (ID 73)</i> <i>The low quality of life (ID 667)</i>
	Burden of treatment	<i>The long treatment process (ID 33)</i> <i>Having to receive chemotherapy (ID 105)</i> <i>The invasive nature of tests and treatment (ID 260)</i>
	Deterioration, both physical and cognitive	<i>It consumes you, bit by bit (ID 205)</i> <i>Losing myself because of the disease (ID 42)</i> <i>It completely destroys your body (ID 81)</i>
	Impact on body image ¹	<i>Losing my breasts (ID 172)</i> <i>Living with a [ostomy] bag (ID 32)</i> <i>Not feeling like a woman (ID 98)</i> <i>That it impacts my sense of femininity (ID 61)</i> <i>Receiving a mastectomy (ID 338)</i>
Neurological	Forgetting who one is, one's life, and one's loved ones	<i>Dying without remembering everything I have done in life (ID 93)</i> <i>Not recognizing my loved ones and losing my sense of self (ID 134)</i> <i>Lose the memories of your life and the people around you (ID 120)</i>
	Deterioration, both physical and cognitive	<i>Losing my independence or physical function (ID 183)</i> <i>Dying like a vegetable (ID 414)</i> <i>Feeling useless, both physically and mentally (ID 225)</i>
	Being a burden to family	<i>That, in addition to me, it affects my loved ones above all (ID 72)</i> <i>The pain that my relatives would suffer (ID 426)</i> <i>Not allowing those taking care of me live their lives (ID 213)</i>
Cardiovascular	Functional and mental disability	<i>The neuropsychological consequences after stroke (ID 91)</i> <i>That you don't know which functions will be affected (ID 147)</i> <i>Being left with serious sequelae or in a vegetative state (ID 615)</i> <i>Forgetting who I am (ID 99)</i>
HIV/AIDS	Incurable	<i>That even if treated, it will remain with me for life (ID 404)</i> <i>That it's incurable and very harmful (ID 617)</i> <i>That there is no cure and it's hard to keep it under control (ID 310)</i>
	Infect someone	<i>That I also have to worry about not infecting other people (ID 390)</i> <i>Early death and fear of infecting someone through intimate contact (ID 302)</i> <i>It's an incurable disease and relatively easy to spread and contract (ID 52)</i>
	Social stigma	<i>Being unable to have ever again normal relationships and sexual relations (ID 83)</i> <i>The social exclusion (ID 442)</i>

Note: ¹ concerns regarding body image were exclusively voiced by participants who reported breast cancer, and to a lesser extent, colon cancer.

3. Discussion

This study investigated the extent to which cancer constitutes the most frightening disease to young Spanish women. We also investigated whether availability bias may account for heightened (breast) cancer concern, relative to other chronic conditions.

The results offered support to the first hypothesis: participants in the recall condition most frequently selected cancer as the condition eliciting the highest level of fear (Table 3). This finding may be attributed to several aspects. First, cancer continues to be a highly prevalent and threatening condition [18,19]. To the eyes of many participants (63.50%), cancer constituted the disease causing the highest number of deaths among Spanish women—an inaccurate perception though [3]. Most participants (86.27%) also believed that cancer was the condition receiving the most attention in the mass media prior to the COVID-19 pandemic. Therefore, these aspects may have jointly contributed to strengthening the salience of cancer in relation to other diseases, increasing the probability that a woman would answer “cancer” when asked to name which disease she feared most. Upon considering different types of cancer, breast cancer was the type most frequently reported as most frightening, which offered support to the second study hypothesis. Based on the qualitative data analyses, participants who selected cancer as the most frightening disease reported similar concerns (e.g., poor prognosis, burden of treatment), regardless of the type of cancer (Table 5). However, those who felt particularly afraid of breast and colon cancer often expressed concerns about body image, related for example to losing their breasts, receiving a mastectomy, or wearing an ostomy bag.

The probability of selecting a given disease as the most frightening, however, varied as a function of availability bias [32]; in other words, it depended on the way participants were requested to report which disease they feared most. Participants allocated to the recognition condition were much less likely to report cancer as the condition they feared most. That is, they were less likely to select cancer when presented on a list along with other diseases, which seemed to reduce cancer’s relative salience. Within the recognition condition, a larger number of women selected neurological conditions ($N = 133$) as the most frightening disease than that selecting cancer ($N = 121$) ($\chi^2(10) = 0.57, p = .451$). Further, post hoc analyses revealed that the proportion of women selecting breast cancer in the recognition condition was significantly lower than that in the recall condition ($\chi^2(10) = 16.62, p < 0.001$). These results therefore provide experimental evidence that a heightened fear of cancer, and more specifically breast cancer, may be partly a function of salience, that is, the ease with which cancer is remembered and available in women’s minds. In other words, whether cancer constitutes the disease (that at least some) women fear most may depend on how hard they think about it.

Relatively few participants in this study (>10%) reported cardiovascular disease as the most frightening health condition. Cardiovascular disease, however, constitutes the number one cause of death among women within the 57 member countries of the European Society of Cardiology. Based on data from 2019, it accounted for 2.2 million deaths among females, more than double that accounted for by all types of cancers combined (i.e., 900,000) [3]. Nonetheless, only three participants within the recall condition reported cardiovascular disease as the most frightening disease, compared to 56 within the recognition condition. The former suggests that cardiovascular diseases were not sufficiently salient to participants, even though they constitute the number one cause of death among European females. The latter suggests that, relative to other health problems, cardiovascular diseases may still not elicit the level of concern they merit. Previous research has revealed that women view cardiovascular disease as relatively controllable in comparison to other chronic conditions [17], which again, may be partly related to the way they are represented in the media. One previous study, for example, observed that media stories about cardiovascular disease were much more likely to include information about prevention in comparison to those about breast cancer [26]; this may give women the impression that there is much more to do to protect oneself against cardiovascular disease in comparison to cancer. However, the results presented here do reveal concerns with the uncontrollability

of cardiovascular conditions. For example, some participants who reported feeling most frightened of suffering a stroke (Table 3) alluded to functional disability and cognitive impairment, which are aspects beyond one's control (Table 5). Therefore, these results suggest that not only may some women fail to report which conditions they truly fear most due to availability bias, they may also fail to consider highly concerning aspects about less salient diseases, such as cardiovascular conditions.

These findings bear several implications for public health. Altogether, these results provide experimental evidence that availability bias may partly account for a heightened fear of (breast) cancer, which, in turn, may narrow the scope of women's information-seeking and health-preventive behaviors. That is, heightened cancer concern may divert attention away from health conditions that, based on these results, are also highly frightening to women, such as Alzheimer's disease. Further, heightened cancer concern may decrease the salience of cardiovascular disease, which poses a major health risk to Spanish/European women. Furthermore, heightened cancer concern may attenuate perceptions of risk of different health conditions: just a minority of participants in this study ($N = 191$, 25.50%) were aware that cardiovascular disease, and not cancer, was the number one cause of death among Spanish/European women [3]. Therefore, this all highlights the need for interventions that increase the salience, relative to cancer, of other health conditions that pose significant risks to women. In order to avoid unnecessary alarm, such interventions should also highlight preventive behaviors that significantly reduce risk and increase women's sense of control. Previous studies, for example, have observed that cancer is often perceived as unpredictable and indestructible, and a recent review found that many people believe that cancer results from aspects that are relatively difficult to control (e.g., stress) [34]. Such unfounded beliefs may demotivate women to follow preventive practices, which highlights the importance that health campaigns also include information about the things they can do to prevent chronic conditions.

It is worth noting that many women may show concern of more than one disease at a time; that a majority of participants reported feeling most afraid of cancer does not rule out that they may also fear other diseases. However, previous studies do suggest that a heightened concern of cancer may indeed divert attention from other health conditions presenting a similar or even higher health risk, such as cardiovascular disease [31,35].

Altogether, these findings pose some questions for future research. Many studies have focused on exploring the factors accounting for breast cancer concern [34]. Fewer studies, however, have explored women's beliefs and attitudes towards other major health conditions, such as cardiovascular disease [36] and Alzheimer's disease. Future studies aiming to do so may help unveil misconceptions and, based on these results, offer further insights into the factors that may result, especially concerning these two conditions. This type of information may be relevant to health campaigns seeking to increase preventive behaviors, at times when the incidence rates of these conditions are expected to increase.

The results of this study should be interpreted in light of some limitations. Participants in this study were recruited following the snowball sampling method, and thus they are unlikely to represent the population of young (i.e., aged 18–40) Spanish women. Second, participants' responses regarding their fear of chronic conditions are likely to be influenced by the type of media they are exposed to, and mortality and prevalence rates of these conditions within Spain and Europe. Therefore, the findings pertaining the diseases eliciting the highest fear may not correspond to the perceptions of women from other world regions.

4. Materials and Methods

Participants were eligible if they were female, between the ages of 18 and 40, and resided in Spain. Younger females were of interest for this study because (1) they were less likely to be living with chronic conditions, and (2) we were interested in assessing misperceptions and fear/concern related to chronic conditions that may influence health-preventive practices relatively early in adulthood.

4.1. Procedure

This study was approved by the Ethics Committee of Universidad Europea de Madrid (ID# CIPI/21/004). Participants were recruited using the snowball sampling method by means of an online survey posted on social media platforms (i.e., Facebook, Twitter, and Instagram). Data were gathered between June 2021 and February 2022. All participants provided written consent.

Participants first provided basic information on demographic characteristics and personal and family medical history. Second, they completed measures on the general fear of injuries and illness. Third, they were randomly assigned to one of two experimental conditions. In the *recall* condition, participants were asked to name the health condition they feared most (i.e., “Now thinking about all the different illnesses people can get, which one illness would you worry most about getting?”) [16]. In the *recognition* condition, participants were presented with a list of different health conditions (alphabetically ordered in Spanish) and asked to choose the one they feared most:

- Hypertensive heart disease;
- Colon and rectum cancers;
- Stomach cancer;
- Breast cancer;
- Pancreas cancer;
- Lung cancer;
- Cirrhosis of the liver;
- Stroke;
- Diabetes mellitus;
- Alzheimer’s diseases and other dementias;
- Ischemic heart disease;
- Chronic obstructive pulmonary disease;
- HIV/AIDS;
- Other, if not on the list above_____.

The list of health conditions was constructed based on the WHO Global Health Estimates 2019 [6] and comprised some of conditions with the highest mortality rates within the WHO European Region. Randomization followed a 4:3 allocation ratio, as it was expected that some of the responses by participants in the recall condition might be unclear and/or unspecific, and might need to be excluded. Fourth, participants were requested to state in a few words the reasons they feared the health condition they reported. Last, participants were asked to name the disease they thought caused the highest number of deaths among Spanish women, and the disease they thought received the most attention in the mass media and social media prior to the COVID-19 pandemic (see Appendix A for the specific questions presented to participants).

4.2. Measures

Basic information on demographic characteristics and medical family history was obtained using a questionnaire specifically designed for this study. In addition, participants answered the questions and completed the questionnaires described below.

The Illness/Injury Sensitivity index [37,38] was designed to measure the general fear of illness and injuries. Responses are provided using a 5-point Likert scale ranging from 1 (“very slightly agree”) to 5 (“strongly agree”). The scale comprises two factors: fear of illness and fear of injury, which yielded internal consistency (Cronbach’s alpha) values of 0.89 and 0.83, respectively. Higher scores in both subscales indicate higher levels of fear of injury and illness.

Additionally, participants were also asked to

1. Briefly state, using a few words, which aspects associated with the disease they feared most they found concerning;

2. Report which health condition they thought caused the highest number of deaths among Spanish women;
3. Report what health condition they thought received most attention in the mass media and social media prior to the COVID-19 pandemic.

4.3. Statistical Analyses

Statistical analyses were executed using SPSS version 29. A conservative p -value of $p < 0.01$ was adopted to adjust for the inflation in familywise error that results from conducting multiple statistical tests.

Preliminary data analyses. Data were screened for missing values and outliers and examined for compliance with the statistical assumptions of the t -test and the Pearson's chi-square test. Frequencies and descriptive statistics were calculated to summarize the sample's demographic and medical characteristics, and to provide descriptive information about the study variables.

Baseline group differences. T -tests were performed to assess group differences in general injury and illness. Effect size was measured using Cohen's d , wherein the values 0.2, 0.5, and 0.8 represent small, medium, and large effects, respectively [39].

Most feared health conditions. The Pearson chi-square test was used to identify the health conditions that participants feared most.

Heightened cancer concern as a function of availability bias. Contingency table analyses were performed to assess whether there was an association between the frequency with which participants reported fearing specific conditions and the experimental group. Standardized residuals were calculated to follow up a statistically significant chi-square test. Standardized residuals were calculated to follow up a statistically significant chi-square test [33]. Standardized residuals follow a z distribution, and therefore, values greater than $|1.96|$ indicate that the observed frequency is statistically different from the expected frequency. In the case of this study, a standardized residual value of 2.54 was adopted as the threshold of statistical significance, to adjust for the inflation in familywise error that results from conducting multiple statistical tests.

Media attention and mortality rates. Descriptive statistics were used to calculate the frequency with which different diseases were perceived to receive the most media attention and result in the highest number of deaths among Spanish women.

Qualitative data analyses. Thematic analysis was performed on participants' responses to outline the specific aspects they found most concerning about the diseases they feared most. The responses regarding diseases reported by less than 5% of participants were not analyzed, due to an insufficient number of responses. This analysis followed the phases proposed by Braun and Clarke [40]. First, participants' written responses were read several times. Second, codes were generated by the first and third authors, following a process of open coding [41]. Third, the codes were organized into themes, which, through a process of open discussion among the authors, were refined into the final themes presented in this paper.

5. Conclusions

The results of this study provide experimental evidence that availability bias may partly account for heightened cancer concern among women. When cancer's salience relative to other chronic diseases was eliminated, women in this study reported being as afraid of neurological conditions as they were of cancer. Therefore, this suggests that (breast) cancer may not be the condition women fear most after all. Nonetheless, participants continue to perceive information about cancer as highly available in the mass media and social media and hold misconceptions about the relative risk posed by cancer. Therefore, this may continue to influence health-information-seeking and preventive behaviors.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

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

Appendix A

Research questions and study design.

-
1. Age _____
 2. Sex
 - a. Female
 - b. Male
 - c. Other
 3. How would you describe your health currently?
 - a. Very good
 - b. Good
 - c. Fair
 - d. Poor
 4. Have you ever been diagnosed with a chronic condition?
 - a. Yes
 - b. No
 5. If yes, which one? _____
 6. Have you ever been diagnosed with a mental disorder?
 - a. Yes
 - b. No
 7. If yes, which one? _____
 8. Has any of your parents ever been diagnosed with a chronic condition?
 - a. Yes
 - b. No
 9. If yes, which one? _____
 10. Has any of your parents ever been diagnosed with a mental disorder?
 - a. Yes
 - b. No
 11. Do you currently smoke?
 - a. Yes
 - b. No
 12. During the last year, how frequently did you drink alcohol?
 - a. Did not drink over past year
 - b. Up to twice per week
 - c. Three or more times per week
 13. How often do you do engage in physical activity lasting more than 30 minutes?
 - a. Less than once a week
 - b. Between once and three times
 - c. More than three times per week
-

-
14. What is your educational level?
- Primary school
 - Secondary school
 - High school or vocational training
 - University degree
15. What is your employment status?
- Student
 - Unemployed
 - Self-employed
 - Employed part-time
 - Employed full-time
 - Home-maker
 - Retired
16. What is your marital status
- Single
 - Married/Common law
 - Separated/Divorced
 - Widowed
17. Please, indicate your level of agreement with the following statements (answered on a scale ranging from 1 “completely disagree” to 5 “completely agree”)
- I am frightened of being injured.
 - The thought of injury terrifies me.
 - I worry about becoming physically ill.
 - The thought of physical illness scares me.
 - I worry about being injured.
 - I worry that I might get a serious physical illness in the future.
 - It would be awful to be injured in any way.
 - It would be awful to have a serious physical illness.
 - I worry about my physical health.
 - I get scared if I think I am coming down with an illness.
 - I can't stand the thought of being injured.
18. Participants were randomized to one of two experimental conditions:

Recall condition

“Now thinking about all the different illnesses people can get, which one illness would you worry most about getting?”

Recognition condition

“From the following list, please select the one illness you would worry most about getting”

- Hypertensive heart disease
- Colon and rectum cancers
- Stomach cancer
- Breast cancer
- Pancreas cancer
- Lung cancer
- Cirrhosis of the liver
- Stroke
- Diabetes mellitus
- Alzheimer diseases and other dementias
- Ischaemic heart disease
- Chronic obstructive pulmonary disease
- HIV/AIDS
- Other, if not on the list above_____

19. Please indicate what aspect of this disease you find most concerning (in a few words)
20. What is the disease you think cases the highest number of deaths among Spanish women?
21. What disease you think received the most attention in the mass/social media prior to the COVID-19 pandemic?
-

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