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The impact of objective/sensationalist media on young women's concern and misconceptions about breast cancer: an experimental study

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Abstract

Background Young women are overrepresented in sensationalist media stories about breast cancer, which has been associated with heightened breast cancer concern within this population. Recent research has also revealed that young women show significant misconceptions about breast cancer, and that these seem to have been increasing over the last two decades. Accordingly, the present study sought to gather experimental evidence on the impact of media messages on negative affect, fear of breast cancer, fatalism, and misconceptions about breast cancer among young women.

Methods 186 females aged 18 to 40 were randomly allocated into one of three experimental conditions, designed to recreate the nature of breast cancer information typically presented in government health websites (i.e. objective information, condition 1) and women's magazines (i.e. sensationalist information); as part of the sensationalist information, participants were either exposed to a photograph of a young woman (i.e. condition 2) or a middle-aged woman (i.e. condition 3) featured as a cancer patient.

Results Participants exposed to sensationalist information (i.e. conditions 2 and 3) reported significantly higher levels of negative affect, fear of breast cancer, and fatalism than participants exposed to objective information, after statistically adjusting for relevant covariates. No statistically significant differences were observed between participants exposed to sensationalist information featuring women of different ages. Overall, participants held important misconceptions about breast cancer. First, they greatly overestimated the risk of receiving a breast cancer diagnosis, especially participants exposed to sensationalist information featuring a young woman. Second, they also believed that breast cancer was most often diagnosed among women just under 50 years of age; participants exposed to sensationalist information (i.e. conditions 2 and 3) estimated the age at diagnosis as significantly lower than those exposed to objective information.

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Conclusions This study provides experimental evidence that sensationalist media increases concern and contributes to misconceptions about breast cancer. Concern and misconceptions may be further exacerbated when sensationalist messages feature a young woman as a cancer patient, thus offering a distorted view of the women typically diagnosed with breast cancer. Overall, participants revealed important misconceptions about breast cancer, which has significant implications for preventive behaviors and health communication.

Keywords Breast cancer, Young women, Fatalism, Misconceptions, Media exposure, Health competence

Introduction

Breast cancer mortality rates within the European Union have significantly declined over the last three decades [1]. This trend, largely attributed to lower use of hormone replacement therapy and improvements in diagnosis and treatment [2], has been most pronounced within Northern European countries, where mortality rates were highest in the past [1]. Based on recent data from NORDCAN [3, 4], the age-standardized mortality rate and the 5-year survival rate of breast cancer among women in Norway -the setting of this study- are now among the lowest and highest in Europe, respectively (i.e. 19 per 100,000, and 91.1). Also based on data from NORDCAN, these constitute positive indicators relative to other commonly diagnosed types of cancer among Norwegian women, such as colorectal (i.e. age-standardized mortality: 23 per 100,000; 5-year survival: 73.2) and lung (i.e. age-standardized mortality: 32 per 100,000; 5-year survival: 35.6) [4]. Despite such optimistic epidemiological trends, previous research has documented that breast cancer remains a highly concerning disease for many women [5, 6], even more so than more prevalent and/or lethal conditions (e.g. lung cancer, cardiovascular disease) [7, 8]. Recent research also shows that many European women hold misconceptions about breast cancer and overestimate their risk of diagnosis [9, 10].

Misconceptions and concern of breast cancer bear important health-related implications. First, fear, anxiety, and/or worry have been often referred to as facilitators or barriers to breast cancer screening [11]. This discrepancy can be attributed to a variety of factors, some of them methodological in nature (e.g. differences in operational definitions and in the use of measures) and others specifically related to the nature and object of the fear, anxiety, and/or worry. For example, several studies have focused on fear/anxiety/worry of very specific aspects (e.g. pain/discomfort, a diagnosis, radiation) while others have focused on general and/or unspecific fear/anxiety/worry (e.g. fear of the medical establishment, fear of cancer). Also, whether fear/anxiety/worry constitutes a facilitator or barrier to screening behavior has been associated with their intensity [11]. Some studies have reported a positive linear relationship between fear/anxiety/worry and the likelihood of screening behavior [12], whereas others have reported an inverted u-shaped relationship [13], wherein only moderate levels seem to facilitate screening

behavior. Further, other studies show that it is important to consider the role of moderators when considering the nature of the relationship between fear/anxiety/worry and screening behavior [14]. Notwithstanding these nuanced findings, a substantial amount of research suggests that heightened fear of breast cancer constitutes a barrier to screening behavior across many countries [5, 15, 16], including Norway [17]. Second, a recent survey fielded in five European countries revealed that most women overestimate their breast cancer age-specific risk; previous studies suggest that this may narrow women's focus regarding prevention, shifting attention away from other conditions that may also pose a high health threat (e.g. lung cancer, cardiovascular disease) [7, 18]. Third, many women show important gaps in knowledge related to the risk factors and prevention of breast cancer. Except for the risk associated with hormone replacement therapy, a study carried out in Germany observed that knowledge about other risk factors declined from 2006 to 2016 [9]. Fourth, several studies have also revealed that many women hold fatalistic beliefs about breast cancer, that is, beliefs that receiving a diagnosis or dying is predetermined/inevitable. Such inaccurate beliefs may further discourage women from learning about or engaging in preventive practices, as preventive practices may be viewed as ineffective [5, 19].

Previous research suggests that heightened concern of breast cancer cannot be accounted for by medical risk factors alone, or the threat posed by breast cancer relative to that posed by other chronic conditions [20]. Breast cancer has received more media attention over the last three decades than any other chronic condition, both in Norway and abroad [10, 21, 22, 23]. Moreover, several studies have reported that breast cancer information in the mass media is often *sensationalist* in nature (i.e. information that exploits, distorts, or exaggerates facts) [24]. For example, breast cancer stories often feature women of a much younger age than what may be expected based on the average age of diagnosis; such young women are often celebrities, which can readily attract much public attention [25, 26]. Drawing from exemplification theory [27], the representation of atypical and vivid exemplars can exert powerful and long-lasting effects on impressions and beliefs. This seems corroborated by previous studies showing that such skewed representations may lead to unwarranted alarm among young women [19,

21, 26]. Further, the relative contribution of different risk factors is frequently not accurately presented. Coverage of breast cancer often emphasizes the role of genetic factors, even though these play a relatively minor role compared to the risk associated with age and modifiable factors (e.g. alcohol, smoking, diet). Such coverage, therefore, may increase concern and even discourage preventive practices, given that it portrays breast cancer as a largely unpredictable and unpreventable condition [25, 28, 29].

The link between media attention and heightened breast cancer concern can be partly accounted for by several psychological mechanisms. First, a recent study provided experimental evidence suggesting that heightened concern of and misconceptions about breast cancer may be a function of availability bias [30], that is, a function of the frequency with which women remember threatening information about breast cancer, relative to other chronic conditions. Second, breast cancer can exert a unique impact on women's sexuality, body image, and sense of femininity [31, 32], an impact that is commonly highlighted in breast cancer stories in the mass media [33, 34]. Thus, the way in which breast cancer is portrayed in this type of stories may in itself exacerbate concern. Third, heightened breast cancer concern may be further amplified by women's propensity to become entangled with the sort of narratives they may be frequently exposed to in the mass media (e.g. "I would feel less of a woman if I had breast cancer"), given the abundance of information on breast cancer and its consequences. Such a process, often referred to as *cognitive fusion*, has been associated with increased concern about breast cancer [35], as well as with negative affect and difficulties to effectively respond to life's challenges [36]. Fourth, heightened concern about breast cancer following exposure to sensationalist information may be function of perceived health competence, as health competence is associated with outcome and behavioral expectancies [37]. In other words, women who believe they could effectively engage in preventive behaviors, and thus, reduce the likelihood of receiving a breast cancer diagnosis may be expected to show relatively low level despite exposure to sensationalist information about breast cancer.

The present study

This study sought to gather experimental evidence on the impact of media messages on (a) negative affect, fear of breast cancer, and fatalism; and (b) misconceptions about breast cancer (i.e. perceptions about average age of breast cancer diagnosis, and estimated probability of receiving a diagnosis and survive breast cancer). The population of interest was young women (i.e. aged 18 to 40), given that they are overrepresented in sensationalist media stories about breast cancer [25, 26, 38]. Breast cancer incidence

rates among Norwegian women aged 40 or less have been steadily increasing over the last five decades. Such incidence, however, is still below 50 cases per 100,000, considerably lower than that observed among women in upper age groups [39].

The experimental manipulation was designed to recreate the sort of breast cancer information typically presented in government health websites (i.e. objective information) and women's magazines, both print and digital (i.e. sensationalist information). By experimentally manipulating the type of information women were exposed to, and observing the impact thereof on the outcome variables, this study aimed to fill a gap in this area of research, wherein most previous studies have followed nonexperimental designs. Further, to our knowledge, no studies of this nature, design, and focused on young Norwegian women had been conducted. Based on previous research, it was hypothesized that:

- 1) Women exposed to sensationalist information, relative to objective information, would report higher levels of negative affect, fear of breast cancer, and fatalism.
- 2) Women exposed to sensationalist information, relative to objective information, would report a higher degree of misconceptions regarding breast cancer.
- 3) Women exposed to sensationalist information featuring a young woman as a cancer patient would report higher levels of negative affect, fear of breast cancer, and fatalism, relative to women exposed to sensationalist information featuring a middle-aged woman as a cancer patient.
- 4) Women exposed to sensationalist information featuring a young woman as a cancer patient would report a higher degree of misconceptions regarding breast cancer, relative to women exposed to sensationalist information featuring a middle-aged woman as a cancer patient.

Methods

Participants

Inclusion criteria comprised females between the ages of 18 and 40 who were fluent in both Norwegian and English. Exclusion criteria comprised females with a personal history of cancer. Two hundred and forty-one participants completed the study. However, based on the exclusion criteria, data from 43 to 9 participants were excluded because of a personal history of cancer and being over 40 years of age, respectively. Three participants were further excluded for failing an attention check. Therefore, data from 186 participants were included in the data analyses. Demographic information about participants is presented in Table 1.

Table 1 Demographic characteristics of the sample divided by group

	Cond. 1* (N=60)	Cond. 2* (N=65)	Cond. 3* (N=55)
	Mean (SD)	Mean (SD)	Mean (SD)
Age	27.58 (6.23)	26.60 (5.30)	27.18 (5.81)
	N (%)	N (%)	N (%)
Education			
Elementary school	2 (3.00)	0	0
High school	26 (39.40)	18 (27.70)	14 (25.50)
University	38 (57.60)	47 (72.30)	39 (70.90)
Missing	0	0	2 (3.60)
Marital status			
Single	34 (51.50)	25 (38.50)	25 (45.50)
Cohabiting	18 (27.30)	32 (49.20)	20 (36.40)
Married/Common law	13 (19.70)	8 (12.30)	10 (18.20)
Missing	1 (1.50)	0	0
Work status			
Student	32 (48.50)	34 (52.30)	25 (45.50)
Work part-time	6 (9.10)	3 (4.60)	7 (12.70)
Work full-time	27 (40.90)	28 (43.10)	19 (34.50)
Unemployed	1 (1.50)	0	4 (7.30)
Family history breast cancer**			
No	62 (93.90=)	60 (92.30)	52 (94.50)
Yes	4 (6.10)	5 (7.70)	3 (5.50)

Note Cond. = condition; *Participants in condition 1 were exposed to objective information about breast cancer, participants in condition 2 were exposed to sensationalist information about breast cancer featuring a young woman, and participants in condition 3 were exposed to sensationalist information about breast cancer featuring a middle-aged woman; **family history was considered as first-degree relative

Instruments

A questionnaire was specifically designed to obtain information about basic demographic characteristics. Participants were also requested to report whether they or a close family member had ever been diagnosed with breast cancer.

Cognitive Fusion Questionnaire (CFQ) [40]. The CFQ comprises 7 items (e.g. I tend to get very entangled in my thoughts) answered on a 7-point Likert scale ranging from 1 (“never true”) to 7 (“always true”). Higher scores indicate higher levels of cognitive fusion. The internal consistency (Cronbach’s alpha) within the current sample was 0.96.

Perceived Health Competence Scale (PHCS) [37]. The PHCS comprises 8 items (e.g. I succeed in the projects I undertake to improve my health) answered on a 5-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). Higher scores are indicative of higher levels of perceived self-efficacy regarding general health-related behaviours. The internal consistency (Cronbach’s alpha) of the scale within the current sample was 0.84.

Positive and Negative Affect Scale (PANAS) [41]. The PANAS comprises two subscales measuring positive and

negative affect, of ten items each. Responses are provided using a 5-point Likert scale ranging from 1 (“very slightly or not at all”) to 5 (“extremely”). In this study participants were only presented with the negative affect subscale, conceptualized as a general dimension of subjectively perceived stress and aversive mood states (e.g. distressed, upset, scared). High scores indicate high levels of distress. The scale has previously been used to evaluate positive and negative affect within different time frames (e.g. today, previous week); in the present study, participants were asked to rate their negative affect right after they finished reading the information about breast cancer presented as part of the experimental manipulation, taking into consideration their feelings while reading such information. The internal consistency (Cronbach’s alpha) in the current sample was 0.91.

Champion Fear of Breast Cancer Scale (CFBCS) [42]. The CFBCS comprises 8 items (e.g. The thought of breast cancer scares me) answered on a 5-point Likert scale ranging from 1 (“Strongly disagree”) to 5 (“Strongly agree”). Higher scores are indicative of higher levels of fear of breast cancer. The internal consistency (Cronbach’s alpha) in the current sample was .91. Champion et al. [42] conceptualized fear of breast cancer as low, medium, and high based a score of 8–15, 16–23, and 24–40, respectively.

Fatalism Scale (FS) [43]. The FS comprises 20 items measured on a 5-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The scale is divided into three subscales: predetermination (10 items) (e.g. If someone is meant to get breast cancer, they will get it no matter what they do), luck (4 items) (e.g. My health is a matter of luck), and pessimism (6 items) (e.g. I will suffer a lot from bad health). Items 1–6 were slightly reworded within this study to refer to “breast cancer” instead of “disease.” Higher scores are indicative of higher levels of fatalism. The internal consistency (Cronbach’s alpha) in the current sample was 0.87.

Misconceptions regarding breast cancer. Participants were requested to provide estimates on (a) the average age at which women are diagnosed with breast cancer, (b) the probability of receiving a breast cancer diagnosis in their life time (0% probability to 100% probability), and (c) the probability of surviving if diagnosed with breast cancer (0% probability to 100% probability).

Procedure

The Ethics Committee of the European University of Madrid approved this study. Participants were recruited by means of an online survey publicly posted on social media platforms (i.e. Facebook, Snapchat, Instagram, and LinkedIn); the survey was broadly framed as a study seeking to evaluate women’s attitudes and perceptions

about general health and breast cancer. All participants provided written consent.

The study's procedure followed the sequence below, wherein participants.

- 1) Provided information about demographic characteristics and personal and family history of breast cancer.
- 2) Completed the CFQ and PHCS.
- 3) Were randomly allocated to one of three experimental conditions.

Participants in condition 1 were presented with objective information about breast cancer, including causes, treatments, prevalence, and prognosis. This information was retrieved from the American Cancer Society (2019) and the Norwegian Health Informatics webpages (2020), and was written in an objective manner, meant to recreate the type of information presented in official health websites such the ones just mentioned (see appendix) [44].

Participants in condition 2 were presented with a picture of a fictitious young woman with breast cancer, that is, a picture of a 27-year-old woman dressed up to mimic the appearance of a cancer patient (e.g. wearing headscarf, pale skin, dark shadows under the eyes). The picture was presented along a narrative highlighting the negative physiological and psychological impact of breast cancer and its treatment process on several life domains. The story was based on -and meant to represent- the type of sensationalist information found in Norwegian newspapers and women's magazines [45, 46, 47, 48].

Participants in condition 3 were presented with the same picture and narrative as participants in condition 2. The only difference was that the face of the woman appearing in the picture was aged to resemble a middle-aged woman.¹ The rest of details in the picture remained the same.

- 4) Participants completed the negative affect scale from the PANAS, the CFBCS, and the FS.
- 5) Participants reported on the estimated average age at which women are diagnosed with breast cancer, and on the perceived probability that they received a diagnosis of breast cancer during their lifetime and they survived breast cancer if diagnosed.

Statistical analyses

Preliminary data analyses

Data were screened to detect outliers, missing values, and to ensure compliance with the statistical assumptions of

Analysis of Covariance (ANCOVA; i.e., normally distributed data, homogeneity of variance, and homogeneity of regression slopes). Frequencies and descriptive statistics were calculated to assess the sample's demographic characteristics and provide descriptive information about the study variables.

Baseline group differences

A series of ANOVAs were performed to assess whether there were baseline differences in cognitive fusion and perceived health competence among participants in the three experimental conditions.

Group differences in breast cancer concern

A series of ANCOVAs were performed to test whether there would be group differences in negative affect, fear of breast cancer, and fatalism, while taking into consideration the effect of relevant covariates (i.e. age, history of cancer among first-degree relatives, cognitive fusion, and perceived health competence). Effect size was calculated using eta square (η^2), wherein the values 0.01, 0.06, and 0.14 represent a small, medium, and large effect size, respectively [49]. A priori power analyses using G*Power [50] indicated that a sample size of 158 would be required to provide 80% power to detect a medium effect size ($f=0.25$) with an alpha level of 0.05.

Group differences in misconceptions

A series of ANCOVAs were performed to assess whether there would be group differences in the average age participants estimated breast cancer is first diagnosed, and the perceived probability of receiving a breast cancer diagnosis and surviving if diagnosed. Age, history of cancer among first-degree relatives, cognitive fusion, and perceived health competence were included as a covariates in these analyses.

Results

Preliminary analyses

There were no missing values. No univariate or multivariate outliers were detected, based on the use of the outlier labelling rule [51] and Mahalanobis distance. The assumption of normally distributed data was satisfied, as values of skewness and kurtosis fell within the recommended values of ± 2 and ± 7 , respectively [52]. The assumption of homogeneity of variance was satisfied: the results of Levene's test of homogeneity of variance yielded statistically non-significant results (i.e. $p>.05$) in all cases. The assumption of homogeneity of regression slopes was also satisfied: interactions terms (i.e. experimental group * covariates) predicting outcome variables yielded non-significant results.

¹ A pilot survey was conducted with 10 young women (not included as participants in the study), and they estimated that the women in the images were approximately 30 and 60 years of age.

Table 2 Analyses of covariance (and planned comparisons) examining the impact of media information on breast cancer concern

Negative affect (DV)	F	p	η^2
Breast cancer information (IV)	4.77	0.010	0.051
Age (CV)	12.59	<0.001	0.066
Hist. cancer dx first-degree relatives** (CV)	0.42	0.519	0.002
Cognitive fusion (CV)	4.56	0.34	0.025
Perceived health competence (CV)	6.57	0.011	0.035
Planned Comparisons	Mean (SE)	t	p
Condition 1*	16.68 (0.88)		
Condition 2*	19.82 (0.87)		
Condition 3*	20.24 (0.95)		
Condition 1 vs. Condition 2		-2.55	0.012
Condition 1 vs. Condition 3		-2.75	0.006
Condition 2 vs. Condition 3		-0.32	0.746
Fear of breast cancer (DV)	F	p	η^2
Breast cancer information (IV)	5.29	0.006	0.056
Age (CV)	1.23	0.270	0.007
Hist. cancer dx first-degree relatives (CV)	0.03	0.868	0.000
Cognitive fusion (CV)	6.91	0.009	0.037
Perceived health competence (CV)	8.99	0.003	0.048
Planned Comparisons	Mean (SE)	t	p
Condition 1*	20.85 (0.77)		
Condition 2*	24.11 (0.78)		
Condition 3*	23.87 (0.85)		
Condition 1 vs. Condition 2		-2.94	0.004
Condition 1 vs. Condition 3		-2.60	0.010
Condition 2 vs. Condition 3		0.21	0.833
Fatalism (DV)	F	p	η^2
Breast cancer information (IV)	7.67	0.001	0.079
Age (CV)	1.37	0.244	0.008
Hist. cancer dx first-degree relatives (CV)	0.00	0.984	0.000
Cognitive fusion (CV)	3.10	0.080	0.017
Perceived health competence (CV)	18.76	<0.001	0.095
Planned Comparisons	Mean (SE)	t	p
Condition 1*	40.65 (1.26)		
Condition 2*	44.53 (1.27)		
Condition 3*	47.97 (1.38)		
Condition 1 vs. Condition 2		-2.17	0.32
Condition 1 vs. Condition 3		-5.07	<0.001
Condition 2 vs. Condition 3		-1.83	0.069

Note DV = dependent variable; IV = independent variable; CV = covariate; Cond. = condition; *Participants in condition 1 were exposed to objective information about breast cancer, participants in condition 2 were exposed to sensationalist information about breast cancer featuring a young woman, and participants in condition 3 were exposed to sensationalist information about breast cancer featuring a middle-aged woman; Hist. cancer dx first-degree relatives = History of cancer diagnosis among first-degree relatives

Baseline group differences

No baseline differences in cognitive fusion ($F(2, 183) = 0.34$, $p = .715$) or health competence ($F(2, 183) = 0.75$, $p = .475$) were observed across experimental conditions.

Group differences in breast cancer concern

The results of three ANCOVAs revealed a statistically significant main effect of breast cancer information on negative affect, fear of breast cancer, and fatalism, after statistically adjusting for the covariates age, history of cancer diagnosis among first-degree relatives, cognitive fusion, and perceived health competence. Post hoc analyses revealed that participants within conditions 2 and 3 (i.e. exposed to sensationalist information) reported significantly higher levels of negative affect, fear of breast cancer, and fatalism than participants in condition 1 (i.e. exposed to objective information). No statistically significant differences in the aforementioned variables were observed between participants in conditions 2 and 3 (Table 2). This offered support to hypothesis 1 but not hypothesis 3.

Group differences in misconceptions

Three ANCOVAs were performed to assess misconceptions as a function of media exposure (Table 3). The results of a first ANCOVA revealed a statistically significant main effect of breast cancer information on the average age at which participants estimated breast cancer diagnoses are established, after statistically adjusting for the covariates age, history of cancer diagnosis among first-degree relatives, cognitive fusion, and perceived health competence. Post hoc analyses indicated that participants exposed to sensationalist information (i.e. conditions 2 and 3) estimated that breast cancer diagnoses are established on average at a younger age than participants in condition (1). This offered support to hypothesis (2). There were no differences between participants exposed to sensationalist media featuring a young and middle-aged woman.

The results of a second ANCOVA revealed a statistically significant main effect of breast cancer information on the perceived probability of receiving a breast cancer diagnosis, after statistically adjusting for the covariates age, history of cancer diagnosis among first-degree relatives, cognitive fusion, and perceived health competence. Post hoc analyses revealed that participants exposed to sensationalist information featuring a young woman as cancer patient (i.e. condition 2) reported a higher perceived probability of receiving a breast cancer diagnosis than participants exposed to objective information (i.e. condition 1) and those exposed to sensationalist information including a middle-aged woman as a cancer patient (i.e. condition 3). This offered partial support to hypotheses 2 and full support to hypothesis 4.

The results of a third ANCOVA revealed no significant main effect of breast cancer information on the perceived probability of surviving breast cancer. This failed to offer support to hypotheses 2 and 4.

Table 3 Analyses of covariance (and planned comparisons) examining the impact of media information on misconceptions

<i>Probability of own breast cancer diagnosis (DV)</i>	F	p	η^2
Breast cancer information (IV)	4.56	0.012	0.049
Age (CV)	4.54	0.034	0.025
Hist. cancer dx first-degree relatives (CV)	23.39	< 0.001	0.116
Cognitive fusion (CV)	3.07	0.082	0.017
Perceived health competence (CV)	8.27	0.005	0.044
Planned Comparisons	Mean (SE)	t	p
Condition 1*	29.09 [†] (2.46)		
Condition 2*	39.34 [†] (2.48)		
Condition 3*	31.87 [†] (2.69)		
Condition 1 vs. Condition 2		-2.93	0.004
Condition 1 vs. Condition 3		-0.76	0.448
Condition 2 vs. Condition 3		2.04	0.043
<i>Probability of surviving breast cancer (DV)</i>	F	p	η^2
Breast cancer information (IV)	0.302	0.740	0.003
Age (CV)	0.452	0.502	0.003
Hist. cancer dx first-degree relatives (CV)	2.15	0.144	0.012
Cognitive fusion (CV)	0.01	0.946	0.000
Perceived health competence (CV)	1.59	0.209	0.009
Planned Comparisons	Mean (SE)	t	p
Condition 1*	76.11 [†] (2.56)		
Condition 2*	74.26 [†] (2.57)		
Condition 3*	73.23 [†] (2.80)		
Condition 1 vs. Condition 2		0.51	0.611
Condition 1 vs. Condition 3		0.76	0.449
Condition 2 vs. Condition 3		0.27	0.786
<i>Estimated average age at breast cancer diagnosis (DV)</i>	F	p	η^2
Breast cancer information (IV)	4.68	0.010	0.050
Age (CV)	2.61	0.108	0.014
Hist. cancer dx first-degree relatives (CV)	0.02	0.895	0.000
Cognitive fusion (CV)	0.04	0.847	0.000
Perceived health competence (CV)	0.10	0.748	0.001
Planned Comparisons	Mean (SE)	t	p
Condition 1*	49.10** (1.30)		
Condition 2*	44.11 ** (1.31)		
Condition 3*	44.13 ** (1.43)		
Condition 1 vs. Condition 2		2.70	0.008
Condition 1 vs. Condition 3		2.56	0.011
Condition 2 vs. Condition 3		-0.08	0.993

Note DV = dependent variable; IV = independent variable; CV = covariate; Cond. = condition; *Participants in condition 1 were exposed to objective information about breast cancer, participants in condition 2 were exposed to sensationalist information about breast cancer featuring a young woman, and participants in condition 3 were exposed to sensationalist information about breast cancer featuring a middle-aged woman; Hist. cancer dx first-degree relatives = History of cancer diagnosis among first-degree relatives; [†]These mean values correspond to probabilities, expressed as percentages; ** These mean values correspond to ages

Discussion

This study sought to gather experimental evidence on the impact objective and sensationalist information about breast cancer may have on young women's level of concern and misconceptions about breast cancer. The stimuli used as part of the experimental manipulation were designed to recreate the sort of information frequently transmitted through two types of sources: health institutions' websites and women's magazines, both print and online. Altogether, the results presented here support those of previous non-experimental [21, 26] and experimental studies [53]: exposure to sensationalist information is associated with increased concern and misconceptions regarding breast cancer.

Participants exposed to sensationalist information reported higher levels of negative affect and fear of breast cancer than those exposed to objective information (Table 2); this offered support to hypothesis 1. These results are consistent with previous research [25, 26] and with exemplification theory [27], according to which vivid narratives are expected to exert a stronger impact on viewers' emotionality than neutral information. Participants in condition 1 were presented with a text of facts about breast cancer: what it is and what the risk factors and treatment options are. This type of information was meant to resemble that found in official health websites [54]. In contrast, the sensationalist information participants were exposed to in conditions 2 and 3 consisted of a narrative told by an ordinary woman, meant to be relatable for participants. The narrative was designed to highlight aspects frequently presented in news stories [45, 46, 47, 48]: the idea that breast cancer can emerge out of nowhere and early on in a woman's life, the burdensome nature of treatment, the long and difficult process of recovery, the risk and fear of recurrence in case of survival, and the feelings of uncertainty and loss of purpose. Altogether, these aspects seem to have brought to the forefront a myriad of aversive emotions and images associated with breast cancer, eliciting increased negative affect and fear of breast cancer. It is worth noting, however, that there were no differences in negative affect and fear of breast between the two groups exposed to sensationalist information; this suggests that the images of a young and middle-aged women used within these two groups did not have an impact on the aforementioned outcome variables, not above and beyond the eliciting and evoking functions of the narrative itself.

Relative to participants exposed to objective information, participants exposed to sensationalist information reported higher levels of fatalism regarding breast cancer (Table 3). This is congruent with previous studies [53] and offers support to hypothesis 1. The narrative presented to participants within conditions 2 and 3 did not mention anything related to modifiable risk factors or effective

coping strategies; rather, it presented a perspective of helplessness, despair, and lack of control over breast cancer and its treatment. Several studies have observed that this is often the way in which breast cancer stories are represented in the mass media [25]. Modifiable risk factors, however, are associated with a reduced likelihood of developing breast cancer, especially among women at higher risk due to nonmodifiable risk factors [55]. Therefore, messages such as these, that understate the significance of modifiable risk factors and preventive practices, may lead young women to believe that developing breast cancer is predetermined and surviving is entirely a matter of luck. This is not to say there that there is not an element of randomness around cancer diagnoses or that these stories do not accurately represent the experiences of many women diagnosed with breast cancer; these findings simply suggest that such messages may shape young women's outlook about breast cancer. Previous research has established that cancer fatalism can discourage individuals from engaging in a variety of protective behaviors and thus can negatively impact health outcomes. For example, cancer fatalism has been associated with beliefs about the futility of cancer screening for early detection, delays in seeing health care practitioners when symptoms first emerge, nonadherence to cancer treatment, and difficulties coping following diagnosis [5, 19].

It is worth highlighting that breast cancer concern was not entirely predicted by the type of information participants were exposed to. The results revealed that higher levels of health competence were inversely associated with lower negative affect, fear of breast cancer, and most significantly, with fatalism. These results appear consistent with previous research [56], and suggests that women that take a proactive stance towards taking care of their health are less likely to believe that health outcomes are predetermined and to be negatively impacted by sensationalist media.

Participants in this study also held important misconceptions about breast cancer (Table 3). First, they overestimated the risk of receiving a breast cancer diagnosis, well above the 9.2% risk for Norwegian women [4]. Such overestimation was significantly more pronounced among participants exposed to sensationalist information featuring a young woman (i.e. 39% risk), in comparison to those exposed to objective information or sensationalist information featuring a middle-aged woman (i.e. 29% and 32% risk, respectively). It is plausible that being exposed to a breast cancer story featuring a young woman may have driven participants to believe that breast cancer is more commonly diagnosed among young females than they may have previously thought, which may have led them to reassess their own susceptibility of being diagnosed. Second, participants estimated the average age of breast cancer diagnosis at 44–49 years, even though

breast cancer is most often diagnosed among women over 50 years of age; the median age at diagnosis among Norwegian women is 62 [54]. Again, the margin of such inaccurate estimations was largest among participants exposed to sensationalist information featuring a young woman. Third, it is worth noting that even though no group differences were observed, participants underestimated the probability of surviving breast cancer if diagnosed; estimated survival rates ranged between 73% and 76%, considerably below those for Norwegian women (i.e. relative five-year survival rate = 91.1%) [4]. Altogether, although not tested within this study, such misconceptions could further increase the level of breast cancer concern and cognitive biases, for example, by guiding participants' attention to sensationalist information about breast cancer. Previous studies highlight that disease-related information plays an essential role in shaping individuals' representations of health threats, which in turn can account for the nature of health and coping behaviors directed at solving health problems [57].

Implications

The findings presented here have implications for prevention and health education. The results of this study offer experimental evidence that sensationalist information may lead to heightened concern of breast cancer; even though participants exposed to objective information seemed to hold misconceptions about breast cancer, exposure to sensationalist information featuring young women as cancer patient was further associated with a higher perception of risk to developing breast cancer. Altogether, in accord with previous research [57], this is something that can hinder preventive behaviors and negatively impact health outcomes. For example, cancer fatalism has been identified as a barrier to screening and health-care-seeking behaviors, and as a factor interfering with adjustment following diagnosis [5, 19]. Most importantly, however, these results also highlight that higher levels of health competence seemed to inoculate participants against the negative impact of sensationalist information, which manifested in lower levels of negative affect, fear of breast cancer, and fatalism (Table 2). This suggests that information leading to higher levels of health and competence, and thus that empowers women, should be more frequently included within official health websites. Higher empowerment may be attained by underscoring the relevant role of modifiable risk factors and breast self-examination in breast cancer prevention, and the importance of seeking timely health care. Importantly, the promotion of such behaviors should also incorporate demonstrations and guided practice, particularly if addressed to less confident or knowledgeable populations, such as young women.

The findings of this study, together with those of previous research [9, 10], also highlight the existence of

important gaps in knowledge regarding breast cancer. This, along with the growing incidence of breast cancer, calls for sustained attention and research within this area. Heightened concern and misconceptions about breast cancer have constituted a health problem for decades, and many studies have focused on this issue. However, higher awareness of breast cancer is something that is not necessarily passed on from one generation to another; further, today's informational context, characterized by the widespread use of social media is different from that present even a decade ago.

Limitations

The results of this study should be interpreted in light of some limitations. First, the sample of participants recruited in this study was rather small, which limits the generalizability of the findings. Participants were also relatively well educated, and thus, may differ from other women with a lower education level, whom for example might report lower levels of health competence. Further, the stimuli used as part of the experimental manipulation cannot possibly represent the wide range of messages and stories about breast cancer found in the media, and more specifically, the social media.

Conclusions

The present study provides experimental evidence that sensationalist information about breast cancer leads to higher levels of concern and misconceptions about breast cancer. The stimuli used as part of the experimental manipulation were designed to recreate two major sources of information about breast cancer: official health websites and women's magazines. The impact of sensationalist information the outcome variables, however, seemed to be mitigated to some extent by higher levels of health competence.

Appendix

Information read by participants in condition 1

What is breast cancer?

Breast cancer is a disease in which cells in the breast grow out of control. Almost all cases of breast cancer originate in the glandular tissue that either produces milk or provides passage for milk, while a minority of cases originate in the surrounding tissue. Breast cancer can spread to the breast through blood vessels and lymph vessels. When this happens, it means that the breast cancer has metastasized.

Causes and risk factors

The exact causes of breast cancer are largely unknown. However, there are genetic and environmental factors that are known to increase the risk, including: age (risk increases with age), family history of breast cancer, a

previous benign breast lump, being overweight, early onset of menstruation (before age 12), late menopause (after 50), having your first child after age 30, never having been pregnant, alcohol intake. It is estimated that about 5–10% of breast cancers are linked to gene mutations passed down through generations of a family. However, this does not guarantee the development of breast cancer.

Treatment

Breast cancer is usually treated using a combination of surgery, chemotherapy, radiation therapy and, in some cases, hormone therapy.

- Surgery can remove only the cancerous mass and a small amount of surrounding tissue (lumpectomy) or the entire breast (mastectomy). Partial or complete mastectomy is often followed by reconstructive surgery.
- Cellulite involves the use of chemicals to kill cancer cells. However, it also attacks normal cells to some extent and causes side effects that include hair loss, a weakened immune system, mouth sores, fatigue and nausea.
- Radiation is usually used either to shrink tumors before surgery, or to destroy small amounts of cancer tissue that remain after surgery. Side effects include breast swelling, vomiting, fatigue, diarrhea or skin irritations that resemble sunburn.

Information read by participants in conditions 2 and 3

This is Anne's story: The phone call came on a completely normal day, when I was standing outside the store: "It's cancer, and I would recommend that you remove your entire breast. We have to start treatment as soon as possible." After this a long and difficult process began: surgery first removed all of my breast, and then came several long rounds of chemotherapy. A few weeks earlier I had found a lump but didn't think much of it. After being urged I went to my family doctor and was very quickly referred to oncology. That's when I experienced my life being turned upside down. Chemotherapy was at first the hardest part. I sat on the couch and felt like my body was working hard, and the side effects would come in quick succession. My hair started falling out, and I had poor appetite, dry skin, sore and dry mucous membranes, and a great need to sleep all the time. At first, I didn't think too much about having lost a breast, but eventually I missed feeling like a woman, and it hurt a lot where my breast had once been. The most challenging thing right now is physical and mental fatigue. The things I used to enjoy doing now just became too much, and I went from being an active person to not being able to do anything. My memory, concentration, and reaction time were impaired, and sometimes I

just felt stupid. Adjustment is difficult because my mind wants to live as before, but my body cannot keep up. I also feel very insecure, and I constantly wonder if I will ever get better. And if I do get better, will it come back again? Will I have the strength to go through all this one more time? I don't want to think about it, and I don't have the energy to think about it, but these thoughts keep coming back. I can't find the meaning of this. I keep asking myself; "why me?" and "what now?" There are still many things I want to do, but now many of my dreams have just vanished. Life very often feels meaningless.

Photographs As described in the methods section, participants in condition 2 were exposed to sensationalist information and a photograph of a young woman, and participants in condition 3 were exposed sensationalist information and a photograph of a middle-aged woman. Young woman.



Middle-aged woman.



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Author contributions

A.A.C.: Conception; design; data analysis; data interpretation; drafted the work; substantively revised the workA. A: H.: Data acquisition; data analysis; data interpretation; drafted the work; substantively revised the workV. M.: Substantively revised the workA. B.E.: Substantively revised the workJ. T.M.: Substantively revised the workAll authors have approved the submitted version (and any substantially modified version that involves the author's contribution to the study). All authors have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Data availability

The dataset from the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki. Ethics approval was obtained from the Ethics Committee of Universidad Europea de Madrid. All participants signed written informed consent.

Consent for publication

Written informed consent for publication was obtained from the person whose photograph was used as part of the information shown to participants. Consent for publication was not required from participants because full anonymity was ensured; no images or any other type of identifying personal details are being published within this study, nor were gathered as part of data collection.

Competing interests

The authors declare no competing interests.

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