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Breast cancer anxiety's associations with responses to a chemoprevention decision aid

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Abstract

Few studies have examined how specific emotions may affect decision-making processes. Anxiety may be especially relevant in health decisions such as those related to cancer in which thoughts of illness or death may be abundant. We examined associations between women's anxiety about developing breast cancer and variables related to their decision to take a medication that could reduce their chances of the disease. Six-hundred and thirty-two American women, who had an increased risk of breast cancer, reviewed a web-based decision aid about tamoxifen. We examined associations between their baseline, self-reported anxiety about developing the disease and post decision aid measures including knowledge about tamoxifen, attitude toward the medication, and behavioral intentions to look for more information and take the medication. Results showed that anxiety was not associated with knowledge about tamoxifen, but it was associated with attitude toward the medication such that women who were more anxious about developing breast cancer were more likely to think the benefits were worth the risks. Greater anxiety was also associated with greater behavioral intentions to look for additional information and take the medication in the next few months. Secondary analyses showed that behavioral intentions were related to knowledge of tamoxifen and attitude toward the medication only for women who were reporting low levels of anxiety. Overall, the findings suggest that anxiety about breast cancer may motivate interest in tamoxifen and not necessarily through affecting knowledge or attitudes.

Keywords

U.S.; Anxiety; Behavioral decision-making; Breast cancer; Tamoxifen

Introduction

Women worry about breast cancer, and in some cases, for good reason. Last year approximately 200,000 women in the United States were diagnosed with breast cancer (Howlader et al., 2011), and in any given year, more than two million American women are at an increased risk for developing the disease (Freedman et al., 2003). These at-risk women may experience anxiety about developing breast cancer (Andersen, Smith, Meischke, Bowen, & Urban, 2003; Brain et al., 2000; Kash, Holland, Halper, & Miller, 1991; Lerman et al., 1991; McCaul, Branstetter, O'Donnell, Jacobson, & Quinlan, 1998) and this emotion could influence their behavior and decision-making related to the disease.

Women who have an elevated risk of breast cancer are eligible to take medications such as tamoxifen and raloxifene that could reduce their chances of the disease by approximately 50% (Cummings et al., 1999; Fisher et al., 1998). Unfortunately, the decision of whether to take these medications can be complex, in part because the medications have significant side effects (Bober, Hoke, Duda, Regan, & Tung, 2004). Anxiety about developing breast cancer may further exacerbate the complexity of this decision. In the current study, we examined whether at-risk women's anxiety about breast cancer was associated with their responses to a decision aid about tamoxifen (at the time of study implementation, the FDA had not yet approved raloxifene for chemoprevention).

One way in which anxiety could affect a decision process generally is by influencing the information that is processed and therefore the comprehension of decision relevant information. Of studies examining decision-making not in the health domain, there have been conflicting results. While some of this research finds support for the "affect as motivation hypothesis" in which anxious states promote careful attention to the content and details of information (e.g., Schwarz, 1990, 2000; Schwarz, Bless, & Bohner, 1991; Schwarz & Clore, 1996), others have not supported this idea (Conway & Giannopoulos, 1993; Ellis & Ashbrook, 1989; Lewinsohn & Mano, 1993; Raghunathan & Pham, 1999). In fact, Conway and Giannopoulos (1993) found evidence to the contrary. In their study, negative affect was associated with the tendency to use less relevant information when making complex judgments. These inconsistencies could stem in part from investigating negative affect generally rather than a specific negative emotion such as anxiety. The majority of these studies were also not in health contexts of which anxiety may be a more relevant emotion.

Of the few studies that have examined anxiety specifically and in the context of a health decision, the findings more consistently suggest an inhibition of careful information processing. For example, Lerman, Seay, Balshem, and Audrain (1995) assessed anxiety about developing breast cancer in women who were deciding whether to have genetic testing for breast cancer. They found that as women's anxiety increased, their comprehension following counseling decreased. In the same decision context, Cameron and Reeve (2006) found that anxiety interacted with knowledge and perceived benefits to influence interest in testing. For participants who were low in anxiety about breast cancer, interest in testing increased as their knowledge and perceived benefits of testing increased. However, for participants who were high in anxiety, they were interested in testing regardless of their knowledge or perceived benefits of the treatment. The authors suggested that anxiety may motivate health behavior, but not through a careful information process.

Of course, rather than simply reducing information processing on the whole, how anxiety influences processing may depend on the information that is being processed. For example, Peters, McCaul, Stefanek, and Nelson (2006) and Peters, Lipkus, and Diefenbach (2006) have recently argued that in decisions related to health, anxiety could act as a spotlight, resulting in more focused attention on some information and less focused attention on other information. In presenting their model, they give the hypothetical example of an individual deciding whether to have radiation for a cancerous tumor. They argue that anxiety about radiation could lead the individual to process information about the benefits of the treatment less carefully while the information about the risks of the treatment is processed more carefully.

In the present study, we test the above ideas and examine whether women's anxiety about developing breast cancer will reduce information processing overall or lead to selective information processing about the chemoprevention medication tamoxifen. Understanding the association between this specific negative emotion and the processing of information in such a relevant medical decision can provide insight into the best practices for how to increase informed decision-making, which is an important goal among researchers and practitioners. An informed decision is likely to occur when individuals have sufficient knowledge relevant to the decision and the decision is in line with their attitudes (Marteau, Dormandy, & Michie, 2001).

In addition to examining relationships between anxiety and information processing, the present study also examines relationships between anxiety and attitude and behavioral intentions related to the tamoxifen decision. Some of the research described above (e.g., Cameron & Reeve, 2006; Peters, Lipkus, et al., 2006; Peters, McCaul, et al., 2006) suggests that anxiety about breast cancer may lead women to perceive greater benefit to treatments related to reducing the risk of the cancer. Anxiety about breast cancer may also motivate women to want to take tamoxifen as a handful of studies have shown that anxiety motivates different types of health behaviors, from cancer screening to quitting smoking (Cameron, 2003, 2008; Cameron & Reeve, 2006; Klein, Zajac, & Monin, 2009; McCaul, Branstetter, Schroeder, & Glasgow, 1996; McCaul, Schroeder, & Reid, 1996; Moser, McCaul, Peters, Nelson, & Marcus, 2007).

Present study: overview and hypotheses

This study was part of a larger intervention study that varied 5 factors to test methods of communicating the risks and benefits of tamoxifen (e.g., presence of a pictograph) among women at an increased risk for breast cancer (Fagerlin et al., 2010; Zikmund-Fisher et al., 2008). This paper represents a secondary analysis of this data in which we examine the associations between women's baseline breast cancer anxiety and primary outcomes following the intervention. None of the original experimental factors resulted in significantly consistent effects related to the goals of this study, but all analyses reported here control for the factors.

In this study, women who were defined as having an increased risk of breast cancer reviewed an online decision aid to learn about tamoxifen, a medication that can reduce the likelihood of a first diagnosis of breast cancer by 50% in women at an increased risk (Fisher et al., 1998). At baseline, participants reported their anxiety about breast cancer. In the decision aid, women were informed of their actual risk of breast cancer (according to the Gail model which uses individual factors such as age, age at first menses, age at first live birth to estimate a 5-year risk of breast cancer; Gail et al., 1989). Women also received tailored information about the risks and benefits of tamoxifen. Following the decision aid, women completed a knowledge test of tamoxifen's risks and benefits, reported their attitude

toward the medication as well as their plans to seek additional information and to take it in the next few months. We examined associations between women's baseline, self-reported anxiety and these primary variables.

Based on previous research (Cameron & Reeve, 2006; Lerman et al., 1995), we had the following hypotheses for the present study. First, we expected that anxiety about developing breast cancer would be significantly associated with knowledge, but this could occur in one of two ways. On one hand, greater anxiety about cancer could lead to less overall knowledge about tamoxifen suggesting less careful information processing (e.g., Lerman et al., 1995). On the other hand, anxiety could lead to selective information processing (e.g., spotlight effect; Peters, Lipkus, et al., 2006; Peters, McCaul, et al., 2006) in which some information, such as the benefits of tamoxifen, is processed more carefully than other information such as the risks of the medication. To test the hypothesis, we examined associations between anxiety and overall knowledge scores as well associations between anxiety and knowledge of risks and knowledge of benefits scores separately.

Our two other hypotheses relate to associations between anxiety and women's attitudes and behavioral intentions. Our second hypothesis was that women who felt more anxious about breast cancer might have a more positive attitude toward tamoxifen. For example, they might see the medication as having greater benefits than risks which would be consistent with previous theorizing and findings (e.g., Cameron & Reeve, 2006; Peters, Lipkus, et al., 2006; Peters, McCaul, et al., 2006). Women with greater anxiety about breast cancer may also report less worry about tamoxifen's side effects, which tend to be a major concern reported by women considering tamoxifen (Bober et al., 2004). Our third hypothesis was based on previous research finding that anxiety motivates health behavior (e.g., Cameron, 2003), and we hypothesized that anxiety about breast cancer would be associated with greater intentions to seek additional information about tamoxifen and take the medication.

Method

Procedure

Participants were recruited from two American healthcare organizations: Henry Ford Health Care System (Detroit, MI) and Group Health Research Institute (Seattle, Washington). Based on medical records, potentially eligible women ($N = 8897$) were sent letters inviting them to participate in an online study to help researchers better understand how to present health risk information and how to help women make informed choices about breast cancer prevention. To be eligible for the study, women had to have an increased risk of breast cancer, a 5-year risk of breast cancer $\geq 1.66\%$ according to the Gail model. Women were not eligible if they had previously been diagnosed with breast cancer or had taken tamoxifen or had contraindications to the medication (e.g., pregnant or nursing). Following online consent, women answered questions to confirm they were eligible for the study. Institutional Review Board approval was obtained by the University of Michigan, Henry Ford Health System, and Group Health Research Institute.

After eligible participants completed a baseline questionnaire in which they reported their anxiety about breast cancer, they reviewed the decision aid. They were then provided with information about tamoxifen including how it works and what its risks and benefits were. Following the decision aid, participants completed a knowledge test of the information they read in the program and reported their attitude toward tamoxifen and their behavioral intentions to seek more information and take it.

Participants

Of the 749 eligible women who came to the website, 663 consented to participate, 650 completed the baseline survey, and 632 (97%) completed the post-decision aid survey. The average age of participants was 59 ($SD = 7.6$), and the majority were White (94%), with 2% Black or African-American, 2% Asian, and 2% reporting “other race”. Women’s 5-year Gail scores ranged from 1.7 to 17.3 with $M = 2.56$.

Measures

Breast cancer anxiety—Breast cancer anxiety was assessed at baseline with three questions, adapted from breast cancer anxiety scales used in previous research (Bowie, Curbow, Laveist, Fitzgerald, & Pargament, 2001; Lerman et al., 1991) and the Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979). The questions were 1) I am worried about developing breast cancer in the next 5 years, 2) The thought of breast cancer scares me, 3) I have to keep myself from getting upset when I think about breast cancer or am reminded of breast cancer. On all three items, participants responded on a 1 (*strongly disagree*)–5 (*strongly agree*) scale. To create a breast cancer anxiety composite, we combined the three questions (Cronbach’s $\alpha = .70$).

Knowledge—Six questions assessed knowledge of information in the program. Four questions focused on the risks of tamoxifen (endometrial cancer, hormonal symptoms, blood clotting, cataracts) and two questions focused on the benefits (breast cancer, reduction in bone fractures). We asked participants who was more likely to experience each risk and each benefit. Response options were 1) women who take Tamoxifen, 2) women who do not take Tamoxifen, 3) both groups are equally likely, and 4) don’t know. We scored responses as correct or incorrect (“don’t know” was scored as incorrect) and then summed the correct responses. Three knowledge scores were computed. First, the average of all six knowledge questions was computed, resulting in an overall knowledge score. Second, the averages of the risks and benefits questions were computed separately, resulting in a benefits knowledge score and a risks knowledge score.

Attitude toward tamoxifen—Two questions assessed participants’ attitude toward tamoxifen. Together, the two measures account for an affective and cognitive response to tamoxifen. Participants indicated their agreement on 5-point scales, from strongly disagree to strongly agree, with the statements, “I don’t think the benefits of tamoxifen are worth the risks of tamoxifen” and “I am worried about the side effects of tamoxifen.” The items were analyzed separately due to low reliability (Cronbach’s $\alpha = .67$).

Behavioral intentions—Three questions assessed behavioral intentions: 1) How likely are you to talk to your doctor about Tamoxifen? 2) How likely are you to look for more information about Tamoxifen (for example, use the Internet, call the numbers listed on the website, etc.)? and 3) Given what you know right now, how likely do you think you are to take Tamoxifen in the next year? Responses were on 5-point scales from not at all likely to extremely likely. We averaged the three questions (Cronbach’s $\alpha = .82$).

Analytic strategy

To examine our primary hypotheses, we conducted a series of multiple regression analyses predicting primary outcomes as a function of women’s breast cancer anxiety reported at baseline. To test how anxiety affected information processing of the decision aid, we examined associations between anxiety and three types of knowledge scores following the decision aid: overall knowledge about tamoxifen, knowledge of the risks of the medication, and knowledge of the benefits. We next examined whether baseline anxiety about breast

cancer would predict one's attitude toward tamoxifen for which two items were separately analyzed: beliefs that the risks (i.e., side effects) of tamoxifen were worth the benefits and worry about the side effects of the medication. Finally, we also conducted regression analyses to examine behavioral intentions as a function of baseline breast cancer anxiety.

In addition to these primary analyses, we conducted secondary, exploratory analyses in which we examined baseline anxiety as a moderator of the association between knowledge and behavioral intentions and attitude and intentions. Previous research suggests that anxiety could moderate the associations between these variables (e.g., Cameron & Reeve, 2006). In other words, the association between knowledge and intentions or attitude and intentions could differ depending on women's level of anxiety. These secondary analyses will provide more insight into anxiety's influence on the decision-making process.

Results

The variables included in analyses in the present study were baseline breast cancer anxiety, overall knowledge about tamoxifen, knowledge of the risks of tamoxifen, knowledge of the benefits of tamoxifen, attitude toward tamoxifen (including the degree to which benefits are worth the risks and worry about the side effects), and behavioral intentions related to seeking more information and taking tamoxifen. Table 1 presents the means and SDs for all of these measures. For all analyses, we conducted multiple regressions, controlling for age, race, and original experimental factors (which are described in Zikmund-Fisher et al. (2008)). The results are presented, by variable, below, and Table 2 presents a summary of the associations.

Primary analyses

Anxiety and knowledge—We predicted that anxiety would be associated with participants' processing of information in the decision aid, leading to either less overall knowledge or differential associations with the benefits vs. risks knowledge of tamoxifen. The data did not support these predictions. Multiple regression analyses revealed that breast cancer anxiety was not associated with participants' overall knowledge score or their benefits or risks knowledge scores (all t s < 1 , p s $> .30$).

Anxiety and attitude toward tamoxifen—Regression analyses revealed that anxiety was significantly associated with participants' agreement with the statement the benefits of tamoxifen are not worth the risks, $B = -.24$, $t = -6.18$, $p < .001$. The negative association suggests women with higher anxiety were less likely to agree with this statement. Anxiety was not significantly related to reports of worry about tamoxifen's side effects, $B = .07$, $t = 1.72$, $p = .09$.

Anxiety and behavioral intentions—Anxiety was significantly related to behavioral intentions, $B = .38$, $t = 10.16$, $p < .001$, showing that women with greater anxiety reported greater intentions to seek more information about tamoxifen and to take it.

Secondary analyses

Exploratory analyses examined whether anxiety moderated the association between knowledge and behavioral intentions, and attitude and intentions. As for knowledge, we first examined the association between knowledge and intentions. Both overall knowledge and knowledge of the benefits of tamoxifen were not significantly associated with behavioral intentions, $B = -.05$, $t = -1.17$, $p = .24$, and $B = .03$, $t < 1$, ns , respectively. However, analyses did show that knowledge of the risks were significantly associated with intentions, $B = -.08$, $t = -1.98$, $p < .05$, suggesting the more knowledgeable participants were of the

risks of tamoxifen, the lower their intentions to look for more information and take it. Finding a significant association between knowledge of the risks and intentions, we next examined whether anxiety moderated this association. Analyses revealed a significant interaction, $B = .36$, $t = 2.54$, $p = .01$ (see Fig. 1). The pattern suggests that while participants with low anxiety showed the significant negative association between knowledge of the risks and intentions, participants with higher anxiety showed no relationship between risks knowledge and intentions.

Next we examined the association between the attitude measures and intentions, and then again tested whether anxiety moderated the associations. Regression analyses showed that both attitude variables were significantly associated with intentions, $B = -.55$, $t = -15.84$, $p < .001$ (for benefits not worth the risks) and $B = -.14$, $t = -3.41$, $p = .001$ (for worry about side effects). The associations were negative suggesting that the more likely women were to agree that the benefits were not worth the risks and that they were worried about the side effects of tamoxifen, the less they were inclined to say they would look for additional information or take tamoxifen. Analyses next showed that anxiety did not moderate the association with the benefit-risk trade-off, $t < 1$, but it did moderate the association between worry about the side effects and intentions, $B = .45$, $t = 2.34$, $p = .02$. As displayed in Fig. 2, the pattern suggests that for participants with low anxiety, greater worry about the side effects of tamoxifen was associated with lower intentions to look for more information and take it. However, for participants with higher anxiety, there was no significant association between worry about the side effects and tamoxifen intentions.

Discussion

Few studies have examined interactions between emotion, cognition, and behavior as a decision-making process is occurring (Schwarz, 2000). Studies that have explored the topic have been in either hypothetical contexts or have examined general feeling states, not specific emotions (Lerner & Keltner, 2000). We examined a specific negative emotion that is hypothesized to be consequential in cancer prevention and treatment decisions (Peters, Lipkus, et al., 2006; Peters, McCaul, et al., 2006). Our results suggest that of women at an increased risk of breast cancer, those who have greater anxiety about the disease may be more inclined to take the breast cancer prevention medication tamoxifen. These women had more positive attitudes toward tamoxifen such that they were more likely to report that the side effects were worth the benefits. They also reported greater intentions to seek additional information and take the medication in the future. Interestingly, the women with greater anxiety did not process information about tamoxifen more (or less) carefully than women with less anxiety. Secondary analyses showed that for women with the higher levels of anxiety, their intentions were not associated with their knowledge or attitude related to the medication.

A number of studies have reported that as breast cancer worry increases, women are more likely to plan to have mammograms and actually have them (Brain, Norman, Gray, & Mansel, 1999; Diefenbach, Miller, & Daly, 1999; Hay, McCaul, & Magnan, 2006; McCaul, Branstetter, et al., 1996; McCaul, Schroeder, et al., 1996). We found a positive relationship between anxiety about breast cancer and women's intentions to learn more about a chemoprevention medication and take it. Bober et al. (2004) similarly found that breast cancer anxiety (as well as worry) was positively associated with deciding to take tamoxifen, and these findings raise the question, why does anxiety promote tamoxifen interest? From a theoretical perspective (e.g., the Health Belief Model; Janz & Becker, 1984), anxiety about a given event could motivate behavior much like perceived risk for the event – indeed the two constructs tend to be highly correlated (e.g., Dillard, Ferrer, Ubel, & Fagerlin, 2012; Lipkus, Klein, Skinner, & Rimer, 2005; Zajac, Klein, & McCaul, 2006). However, research does

show they have distinct associations with behavior (Cameron & Reeve, 2006; Dolcini, Catania, Choi, Fullilove, & Coates, 1996), which suggests that anxiety differs from perceived risk in some unique way.

Compared to traditional models of health behavior that focus on perceived risk, contemporary models give greater attention to affect and are therefore better suited to explaining anxiety's relationship with behavior. One of those models is the cognitive-social health information processing model (C-SHIP; Miller & Diefenbach, 1998), which acknowledges that a topic like cancer is anxiety-provoking. Moreover, for individuals who are highly anxious about cancer, they may be strongly motivated to engage in a behavior to avoid developing the disease, but also motivated to avoid their thoughts or feelings when processing cancer-related information. The theory could explain some of our observations in the present study such as anxiety being associated with behavioral intentions, but not knowledge. The theory also helps to explain the disconnect highlighted by the secondary analyses in which for women with higher anxiety, knowledge and attitude toward tamoxifen did not relate to behavioral intentions.

Other theories that are more specific to decision-making, also give a central role to affect in explaining behavior. Models such as the affect heuristic or risk-as-feelings (Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004; see also Windschitl, 2003) for example, would suggest that people think about risk for a negative health event in terms of their feelings surrounding the event and that their decisions are typically guided by these feelings in an intuitive, automatic or "gut-level" reaction. Similarly, in the present study, anxiety about breast cancer seemed to have led to a somewhat automatic interest in tamoxifen – greater intentions that that did not depend on worry about the side effects or knowledge of the medication's risks.

Another reason anxiety may promote tamoxifen interest is simply because it is an "action" emotion. Years ago, Frijda, Kuipers, and ter Schure (1989) conceptualized anxiety as an emotion characterized by appraisals of high uncertainty and low control, arguing that these appraisals then serve as cues to action. Although there is some support for the idea in hypothetical decision contexts (e.g., fear; Lerner & Keltner, 2000; see also Appraisal-tendency framework, Lerner & Tiedens, 2006), future studies should examine associations between anxiety, uncertainty, perceived control, and behavior in actual health decisions.

Although researchers have argued that negative affective states will increase attention to information (Luce, Bettman, & Payne, 1997; Schwarz & Clore, 1996), including threatening health information (Beckjord, Rutten, Arora, Moser, & Hesse, 2008; Cameron & Diefenbach, 2001), others, at least in health decision contexts, have found that anxiety tends to be associated with less overall knowledge and comprehension (Cameron & Reeve, 2006; Lerman et al., 1995). We did not find direct evidence for either of these ideas. In this study, anxiety about breast cancer was not associated with more or less overall knowledge following a decision aid. It was also not associated with selective processing of information as suggested by some (e.g., Peters, Lipkus, et al., 2006; Peters, McCaul, et al., 2006). Although these primary analyses were not supportive of an association between anxiety and knowledge, secondary analyses were suggestive of a possible inhibitory role of anxiety on decision-making. These analyses showed that as knowledge of tamoxifen's risks increased, women were less interested in the medication, but this was only true for women who were not highly anxious. For women who were reporting higher levels of anxiety, knowledge of the risks of tamoxifen and worry about those risks was not associated with their intentions related to this medication decision.

Future research and directions

Only a handful of studies have examined anxiety as it relates to decisions about health behavior. The present study extends the idea that anxiety motivates health behavior to a chemoprevention medication decision. In the area of medical decision-making, effort should be made to measure anxiety and other emotions that could influence the decision process. One broad question is whether emotions are beneficial to informed decision-making. Damasio (1994) argued that emotions are necessary for *rational* decision-making, but how does this compare to *informed* decision-making and how is a rational decision quantified? Generally, more experimental and prospective research is needed on emotions and decision-making processes.

In the present study, we examined relationships between anxiety and information processing. We operationalized information processing with a measure of knowledge, but future studies might use other types of processing measures. For example, time spent on the information could be an additional way to operationalize processing. Relatedly, we examined whether anxiety would be associated with selective information processing which we operationalized as knowledge of risks and knowledge of benefits scores. We found that anxiety was not associated with selective processing of these different types of information, but it is the case that anxiety could have led to selective processing in a way our measures did not capture. Future research should be devoted to developing reliable measures of selective information processing in health related decisions, an endeavor which can contribute to the larger picture of how emotions influence decision processes.

Limitations

A few caveats are important to note. First, the present study examined anxiety about breast cancer, but some of the previous research we described examined worry about breast cancer. At this point, it is not copiously clear how the two constructs differ. In fact, they have often been used interchangeably in the literature (for a review, see Consedine, Magai, Krivoshekova, Ryzewicz, & Neugut, 2004). Research comparing them has also found that they are highly correlated and they show similar associations with a given health behavior (e.g., Bober et al., 2004; Mullens, McCaul, Erickson, & Sandgren, 2004). Our measure of breast cancer anxiety included a question about worry as well as questions about being fearful of breast cancer and getting upset when thinking about the disease. The three-item measure showed appropriate reliability and therefore we would not expect findings with a straightforward worry measure to be significantly different.¹ Nonetheless, future research needs to further discriminate between these two constructs. One difference is that anxiety may be more likely than worry to be associated with negative affect (Zebb & Beck, 1998) suggesting it may be less adaptive than worry.

A second limitation is that the data were correlational, not experimental. Because we did not manipulate anxiety, but instead examined anxiety that was naturally occurring as women were about to review a decision aid on tamoxifen, participants may have experienced the emotion less extremely. This may have led to weaker effects on information processing. This speculation is consistent with research that has found increasing levels of negative affect to be associated with increasing information processing effects (Luce et al., 1997).

¹To determine if we would obtain different results with a straightforward worry measure, we re-ran analyses with just the worry about breast cancer measure instead of the 3-item composite reported in the paper. Analyses showed that with the exception of the worry about side effects of tamoxifen for which the 1-item worry measure was no longer marginally significant ($t < 1$), the results were similar to those with the 3-item composite. For example, the 1-item worry measure was not significantly associated with knowledge, all β s < 1 . Higher levels of worry about breast cancer was also significantly associated with women's greater (dis) agreement that the risks of tamoxifen were not worth the benefits, $B = -.26$, $t = -6.69$, $p < .001$ as well as greater intentions to look for more information about tamoxifen and take it, $B = .37$, $t = 9.73$, $p < .001$.

Nevertheless, our goal was to examine associations with anxiety in a real, ongoing health behavior decision. We were able to do this by using a large sample of women who were drawn from two large metro areas. Finally, women in our study were largely White, and future research should determine whether these results would also be true for minority women who are at an increased risk of breast cancer.

Conclusion

Tamoxifen has recently been shown to be a cost-effective strategy in reducing breast cancer incidence and improving life expectancy for those who have breast cancer (Noah-Vanhoucke et al., 2011). The present study tested associations between women's anxiety about breast cancer and their responses to a decision aid about tamoxifen. Anxiety was not significantly associated with participants' knowledge of the medication following the decision aid. However, anxiety was positively associated with their attitude toward the medication and their behavioral intentions to look for more information and take the medication in the future. Secondary analyses showed that for women with high anxiety, behavioral intentions were disconnected from their knowledge of tamoxifen's side effects or worry about them.

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Fig. 1. Anxiety about breast cancer $\times$ knowledge of the risks predicting behavioral intentions to seek additional information about and take tamoxifen.

Fig. 2. Anxiety about breast cancer $\times$ worry about the side effects of tamoxifen predicting behavioral intentions to seek additional information about and take tamoxifen.

Table 1Means and *SDs* for primary variables.

Variables	Mean	<i>SD</i>	Sample size
Baseline breast cancer anxiety	2.80	.90	645
Total knowledge	.76	.28	623
Knowledge of risks	.74	.37	624
Knowledge of benefits	.79	.34	623
Worry about side effects of T	4.06	.95	627
Benefits of T not worth the risks	3.68	1.03	626
Behavioral intentions	2.27	1.11	629

Note. Breast cancer anxiety, attitude toward tamoxifen, and intentions were on 5-point scales with higher numbers representing greater anxiety, agreement, and intentions, respectively. The knowledge items were on a 0–1 scale, with 1 representing all items correct.

Table 2Summary of relationships with breast cancer anxiety (regression coefficient β).

Breast cancer anxiety, knowledge of risks and benefits of tamoxifen and behavioral intentions	
Anxiety on knowledge (overall and risk/benefit specific)	1
Anxiety on behavior	10.16 **
Risk knowledge on behavior	-1.98 *
Benefit knowledge on behavior	<1
Anxiety $\times$ risk knowledge on behavior	2.54 *
Anxiety $\times$ benefit knowledge on behavior	1.41
Breast cancer anxiety, attitude toward tamoxifen, and behavioral intentions	
Anxiety on benefits are not worth the risks	-6.18 **
Anxiety on worry about side effects	1.72
Benefits not worth the risks on behavior	-15.84 **
Worry about side effects on behavior	-3.41 **
Anxiety $\times$ benefits not worth the risks on behavior	<1
Anxiety $\times$ worry about side effects on behavior	2.34 *

* *Note.* $p < .05$,** $p < .01$.