The relation between worrying and concerns: The importance of perceived probability and cost

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Abstract

The relation between worrying and individuals' concerns was examined in a sample of 197 college students. Participants described the five undesirable outcomes that they thought about most often, indicated how likely they thought the outcomes were, and how upset they would be by them. Worry severity was measured using the Penn State Worry Questionnaire. The relation between worry severity and the life domains about which individuals were concerned was quite weak. In contrast, as predicted, greater worry was associated with higher probability and cost estimates. In addition, cost estimates moderated the relation between worry severity and probability estimates. The potential importance of perceived threat for understanding worrying is discussed.
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Almost all individuals worry at least some of the time, worrying is common to all of the anxiety disorders (Craske & Hazlett-Stevens, 2002), and excessive worrying is the central feature of generalized anxiety disorder (GAD). Whereas a substantial body of evidence has linked high levels of worrying, including GAD, with several psychological factors, such as avoidance (e.g., Borkovec, Alcaine, & Behar, 2004; Roemer, Salters, Raffa, & Orsillo, 2005), the desire for certainty (e.g., Dugas, Buhr, & Ladouceur, 2004), and cognitive biases (e.g., MacLeod & Rutherford, 2004; Mogg & Bradley, 2005), substantially less research has examined the content of worries.

Several studies have explored the life domains about which individuals are most likely to worry (Borkovec, Shadick, & Hopkins, 1991; Craske, Rapee, Jackel, & Barlow, 1989; Dugas et al., 1998; Hoyer, Becker, & Roth, 2001; Roemer, Silvia, & Borkovec, 1997; Sanderson & Barlow, 1990; Tallis, Davey, & Capuzzo, 1994). Such research has found that most worries fall into one of four life domains: interpersonal/family, work/school, finances, and illness/injury. The rates of worries in these four life domains, as well as differences between individuals with GAD and controls, have varied widely from study to study. For example, Craske et al. (1989) found that unlike controls, individuals with GAD were unlikely to report worries about financial issues, whereas Sanderson and Barlow (1990) found that half of individuals with GAD reported worries about

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financial issues, and Borkovec et al. (1991) and Roemer et al. (1997) did not find differences between controls and individuals with GAD in their rates of finance-related worries. Along the same lines, Craske et al. (1989) and Hoyer et al. (2001) found that individuals with GAD were more likely than controls to report health-related worries, whereas Borkovec et al. (1991) found that controls were more likely than individuals with GAD to report health-related worries.

We propose that worriers differ from nonworriers not in the domains about which they worry, but rather in the magnitude of their perceived threats. As stated by Borkovec, Alcaine, and Behar (2004), "it is the perception of threat that initiates the anxiety process" (p. 81). Two critical properties of threat examined in the present research are the perceived probability of an undesirable outcome and the perceived valence, or cost, of the outcome should it come true (Carr, 1974; Foa and Kozak, 1986). Thus, we explored the possibility that frequent worriers differ little, if at all, from nonworriers in the domains about which they worry but rather differ in their perceptions of how probable and costly their feared outcomes are.

Several studies have examined the relation between probability estimates and worry and GAD. Compared with controls, individuals with GAD, as well as individuals with high trait anxiety (which is significantly associated with, though distinguishable from, worry; e.g., Davey, Hampton, Farrell, & Davidson, 1992), judge hypothetical undesirable events (e.g., a fire in their home) as being more likely (Butler & Mathews, 1983, 1987; MacLeod, Williams, & Bekerian, 1991). Rather than having participants rate the probabilities of hypothetical events, Craske et al. (1989) had participants, who were self-monitoring their worries, rate the probabilities of "the first three 'significant' worries that occurred over the course of 3 weeks" (p. 398). In contrast to the results of Butler and Mathews (1983, 1987) and MacLeod et al. (1991), Craske et al. (1989) found that individuals with GAD did not differ from controls in their probability ratings.

Whereas several studies have examined the relation between probability estimates and worry, only a single study has examined the relation between cost estimates and worry. Butler and Mathews, (1983) found that compared with controls, individuals with GAD rated the cost ("how bad would it be for you?") of hypothetical undesirable events as being greater. Carr (1974) posited that the effects on anxiety of perceived probability and cost were "multiplicative" (p. 315). In other words, it is not merely perceived probability and cost that contribute to anxiety but rather the product, or interaction, of perceived probability and cost that should contribute to anxiety. One reason for this is that one might expect that even if an individual thinks an undesirable outcome is likely, she or he is less apt to worry about it if the perceived cost of the outcome is low. For example, even though most individuals may recognize that there is a high likelihood that they will get a paper cut at some point in the next year, most individuals will not worry about it because of how low the perceived cost is. Butler and Mathews (1983) found that individuals with GAD differed significantly from controls on a score derived by computing the product of probability and cost estimates. Unfortunately, because they did not include "main effects" of probability and cost when they analyzed their data, this result is impossible to interpret—since there were group differences in both probability and cost estimates, there necessarily had to be a group difference in the probability × cost score. What their analysis did not test is whether the interaction between probability and cost predicts group membership above and beyond probability and cost estimates on their own.[1]

In the present study, we explored whether individuals with elevated levels of worrying differ from nonworriers in the domains about which they expressed concerns. Since the results of past research exploring this issue had not been consistent, we did not expect large associations between worrying and the frequency of concerns in different life domains. The present study also examined the relation between worrying and perceived threats. We expected individuals with elevated levels of worrying to perceive their threats as more likely and more costly. In addition, we tested whether the interaction of probability and cost estimates would predict worry above and beyond the impact of the separate probability and cost estimates. We also explored the nature of the interaction, focusing on the degree to which probability estimates are associated with worry severity at different levels of cost estimates. Finally, we explored two additional issues. First, we obtained objective ratings of the severity of individuals' concerns so that we could explore whether the relation between

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[1]An analogy, in analysis of variance (ANOVA) terms, is that one wishes to know whether there is a significant interaction in addition to the two main effects, and the group difference in the probability × cost scores reported by Butler and Mathews (1983) could have been the result of two main effects and no interaction.

cost estimates and worry reflected: (a) genuine differences in the severity of those things worriers and nonworriers were concerned about; versus (b) a bias on the part of worriers to perceive their concerns as being more costly. We anticipated that it is the subjective experience of anticipated cost, rather than the objective cost, that influences worrying. We hypothesize that an individual who believes that the cost of breaking their leg is minimal will be unlikely to worry about breaking their leg, whereas an individual who for some reason believes that the cost of getting a paper cut is large is likely to worry about the prospect of such an outcome. Second, we explored the degree to which probability and cost estimates were specific to worry or were also associated with other facets of psychological distress, such as anhedonic depression and anxious arousal (Nitschke, Heller, Imig, McDonald, & Miller, 2001). Like worry, we expected anhedonic depression and anxious arousal to be associated with elevated estimates of the probability of undesirable events occurring. The reason for this is that we would expect all individuals with elevated levels of distress (e.g., depression and/ or anxiety) to view themselves as less competent and/or to view the world as hostile or dangerous. This is consistent with the findings of Clark, Steer, and Beck (1994), who found that in samples of both undergraduates and psychiatric outpatients, cognitive symptoms such as pessimism and a sense of failure were associated with a second-order general distress factor. Because general distress is associated with cognitive symptoms such as pessimism, we would expect individuals with elevated levels of distress to exaggerate the probability of undesirable events occurring. In contrast, we expected cost estimates and the interaction of probability and cost to be associated specifically with worrying. The cost of an anticipated outcome is central to perceptions of threat, which is why we expected it to be associated with worrying. Our reason for not expecting cost estimates (or the cost × probability interaction) to be associated with anxious arousal or anhedonic depression is based on our hypothesis (discussed below) that cost estimates are driven by factors such as exaggerated goal investment, which would not be expected to be associated with facets of distress other than worrying.

We examined our hypotheses in a large nonclinical sample of individuals who were expected to exhibit a broad range of worry severity. There were two reasons why it seemed sensible to test our hypotheses in such a sample, rather than comparing individuals with GAD with control participants. First, although excessive worrying is a defining characteristic of GAD, as pointed out by Craske & Hazlett-Stevens, 2002, worrying is common to all of the anxiety disorders. For example, individuals with social phobia worry about social rejection and humiliation, whereas individuals with snake phobia worry about being harmed by snakes. Therefore, we did not wish to focus on a single type of anxiety disorder. Second, past research suggests that normal and pathological worrying differ quantitatively rather than qualitatively (Ruscio, Borkovec, & Ruscio, 2001), which would lead us to expect the findings from a large sample exhibiting a wide range of worry severity to generalize to clinical populations.

Methods

Participants and procedure

Participants were 197 undergraduate students (52.3% female) at a large Midwestern university. They ranged in age from 17 to 23 years ($M = 18.7$; SD = 0.9). Most (82.1%) were European-American, with 6.7% Latina/ o, 6.2% African-American, 3.6% Asian-American, and the remaining 1.4% reporting that they belong to other ethnic groups (e.g., biracial). Participants, who completed paper and pencil instruments during a single experimental session, received course credit in Introductory Psychology for participating in the study.

Instruments

Concerns

Instead of asking participants to describe their worries, we used our definition of the content of worries (i.e., concerns) in providing them with the following instructions: "People often think about things that they don't want to happen to them. Some examples of these undesirable outcomes are failing an exam or getting in a car accident. In the five boxes below, we would like you to list the five undesirable outcomes that you think about most often." In addition, for each of these outcomes, participants were asked to indicate how probable they

thought it was that they would actually happen (1 = extremely unlikely; 7 = extremely likely). They were also asked to indicate how upset they would feel if the outcome actually happened (1 = not at all upset; 7 = extremely upset). The five likelihood scores were averaged to form a single perceived probability score, and the five "upset" scores were averaged to form a single perceived cost score. The mean perceived probability scores ranged from 1.0 to 6.3 ($M = 3.5$; SD = 1.2). The mean perceived cost scores ranged from 2.2 to 7.0 ($M = 5.7$; SD = 0.9). We did not expect the internal consistencies of the probability and cost estimates to be especially strong. The reason for this is the wide variety of outcomes that a given individual might be concerned about. For example, even among individuals with GAD, some of their concerns (e.g., being hit by lightning) would be expected to be unlikely, whereas other concerns (e.g., upsetting their romantic partner) would be expected to be far more probable. So, although we expected worriers to have higher average levels of perceived probability and cost than nonworriers, we expected worriers to still have some concerns with relatively low perceived probabilities and costs, and we expected nonworriers to have some concerns with relatively high perceived probabilities and costs. In other words, despite the intraindividual variability, we nonetheless expected to find meaningful differences across participants in their average levels of perceived probability and cost that would distinguish worriers from nonworriers. Consistent with our expectations, the internal consistencies of the probability and cost scales were neither close to zero nor particularly strong ($\alpha = .57$ and $\alpha = .49$, respectively).

In addition to participants' descriptions of their concerns, one of the authors (RJT) made independent ratings of the severity of each concern using a four-point scale (1 = a little bad (e.g., not waking up in time for class); 4 = very bad (e.g., dying, never getting married)). The severity ratings were not based on a manual that indicated severity level for all possible concerns. Instead, the severity ratings were based on the judgment of the rater about the degree of impact each concern would have on a typical college student were the concern to come true. A similar approach to rating severity was employed by Thompson and Berenbaum (in press). Like other researchers (e.g., Craske, Rapee, Jackel, & Barlow, 1989; Dugas et al., 1998; Roemer, Molina, & Borkovec, 1997; Sanderson & Barlow, 1990), we had a judge (the same one who made the severity ratings; RJT) assign participants' concerns into one of a finite set of life domains. We used the following set of life domain categories: (a) interpersonal; (b) achievement (including work and school); (c) health; (d) financial; (e) self-focused concerns (e.g., body image concerns, becoming lazy); and (f) all other concerns. These six categories included all four of the life domain categories (i.e., interpersonal, achievement, financial, and health) that had been used in at least three of the previous similar studies (i.e., Craske, Rapee, Jackel, & Barlow, 1989; Roemer, Molina, & Borkovec, 1997; Sanderson & Barlow, 1990). Interrater reliability was measured by having the other two authors (HB and EMP) independently rate a set of 74 concerns. Interrater reliability of the severity ratings, measured using the intraclass correlation (ICC; Shrout & Fleiss, 1979), treating raters as random effects and the individual rater as the unit of reliability, was .77. Interrater reliabilities of the domain ratings across the three possible pairings of the three raters, measured using κ, were .93, .87, and .85.

Worry

We measured worrying using the 16-item Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). Participants indicated, using a five-point scale (1 = not at all typical; 5 = very typical), how typical of them were a variety of statements, such as "My worries overwhelm me" and "I don't tend to worry about things" (reverse scored). The average was taken, with higher numbers reflecting greater worrying. Internal consistency in the present sample was very high ($\alpha = .95$). Past research has indicated that the PSWQ has excellent test–retest reliability and good convergent and discriminant validity (Meyer et al., 1990; Nitschke, Heller, Palmieri, & Miller, 1999; Nitschke et al., 2001). Participants' PSWQ scores ranged from 16 to 80 ($M = 50.4$; SD = 15.2).

Anxious arousal

To explore whether the hypothesized etiological factors examined in the present study are specific to worry or are also common to other facets of anxiety, we measured anxious arousal. We did so using the 17-item anxious arousal subscale from the Mood and Anxiety Symptom Questionnaire (MASQ; Watson, Weber, Assenheimer, & Clark, 1995). The MASQ was developed as an instrument that would distinguish between

anxiety and depression. Participants indicated, using a five-point scale (1 = not at all; 5 = extremely), how descriptive of them were a variety of statements, such as "hands were shaky" and "had a very dry mouth." The average was taken, with higher numbers representing heightened arousal. Internal consistency in the present sample was moderately high ($\alpha = .80$). Past research has indicated that the anxious arousal subscale of the MASQ has good convergent and discriminant validity (Nitschke et al., 1999; Nitschke et al., 2001; Reidy & Keogh, 1997; Watson et al., 1995). Participants' anxious arousal scores ranged from 17 to 51 ($M = 24.5$; SD = 6.7).

Anhedonic depression

We measured anhedonic depression using the anhedonic depression subscale from the MASQ (Watson et al., 1995). Participants indicated, using a five-point scale (1 = not at all; 5 = extremely), how descriptive of them were 22 statements, such as "felt like nothing was very enjoyable" and "felt like I had a lot of energy" (reverse scored). The average was taken, with higher numbers indicating greater depression. Internal consistency in the present sample was high ($\alpha = .90$). Past research has indicated that the anhedonic depression subscale of the MASQ has good convergent and discriminant validity (Nitschke et al., 2001; Reidy & Keogh, 1997; Watson et al., 1995). Participants' anhedonic depression scores ranged from 27 to 99 ($M = 56.6$; SD = 12.8).

Results

Information concerning the prevalence of concerns in different domains is presented in Table 1. The most common concerns in this sample were in the achievement domain, though interpersonal and health concerns were also rather common. As can be seen in Table 2, consistent with the results of past research, the frequency of concerns in different domains tended to not be associated with the psychopathology dimension scores. Anhedonic depression was not significantly associated with any of the concern domain scores, higher levels of

Table 1
Descriptive statistics of concerns in different life domains

Domain type	Range	M^a (SD)	Frequency[b](%)
Interpersonal	0–4	1.1 (0.9)	71
Health	0–4	1.0 (0.9)	66
Achievement	0–4	1.5 (0.9)	92
Financial	0–2	0.3 (0.5)	25
Self-focused	0–4	0.7 (0.8)	47
Other	0–3	0.4 (0.6)	32

[a]Mean number of concerns per participant in each domain.
[b]Percentage of participants with at least one concern in each domain.

Table 2
Correlations between psychological symptoms and the number of concerns in different life domains

Domain type	Anhedonic depression	Anxious arousal	Worry
Interpersonal	−.03	.09	.17[*]
Health	.02	−.01	−.07
Achievement	.01	−.12	.13
Financial	−.05	−.10	−.11
Self-focused	.02	.18[*]	−.11
Other	.00	−.07	.03

[*]$p < .05$.

worrying were associated with more interpersonal concerns, and higher levels of anxious arousal were associated with more self-focused concerns.

We next proceeded to test whether, as predicted, worrying would be associated with the interaction of perceived probability and cost. This was done by conducting a hierarchical multiple regression analysis (using centered variables) to predict PSWQ scores. Perceived probability and perceived cost were entered in the first step, and the interaction between probability and cost was entered in the second step. As shown in Table 3, both perceived probability and perceived cost predicted worrying. In addition, as expected, the interaction between perceived probability and perceived cost predicted worrying above and beyond the independent contributions of the two, F_{change} (1, 193) = 4.97, $p < .05$. The multiple R was .44, with the addition of the interaction term accounting for a change in R^2 of .02 above and beyond the independent effects of probability and cost. As noted by several researchers (e.g., Champoux & Peters, 1987; McClelland & Judd, 1993), the change in R^2 due to moderation effects are typically quite small, and changes as low as .01 are usually considered important.

As can be seen in Fig. 1, the highest worrying was reported by individuals who had high levels of perceived probability coupled with high levels of perceived cost. We decomposed this interaction following Aiken and West (1991). To examine the effects of perceived probability when perceived costs were low, regression analyses centering costs at one standard deviation below the mean were conducted. To examine the effects of perceived probability when perceived costs were high, regression analyses were conducted centering costs at one standard deviation above the mean. These analyses revealed that the effects of perceived probability were

Table 3
Summary of hierarchical multiple regression analyses predicting PSWQ, anhedonic depression, and anxious arousal scores

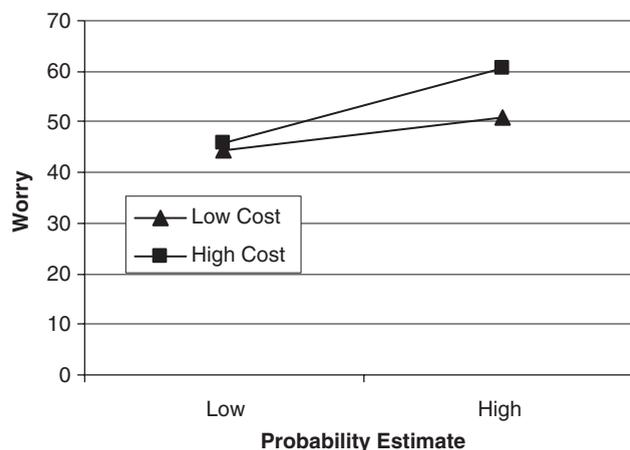| Variable	PSWQ ß	Anhedonic depression ß	Anxious arousal ß
Step 1			
Perceived probability	.37**	.22**	.17*
Perceived cost	.18**	.10	−.06
Step 2			
Perceived probability	.35**	.22**	.15*
Perceived cost	.19**	.10	−.05
Probability × cost	.15**	−.04	.08

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

Fig. 1. The interactive effect of probability and cost estimates on worrying.

diminished when perceived costs were low ($\beta = .21$, $p < .05$) relative to the effects of perceived probability when perceived costs were high ($\beta = .49$, $p < .01$).

To examine the specificity of the associations between perceived probability and cost (and the probability × cost interaction) and worrying, we also conducted hierarchical multiple regression analyses (using centered variables) to predict anhedonic depression and anxious arousal scores. As can be seen in Table 3, both anhedonic depression and anxious arousal were associated with higher levels of perceived probability but were not associated with either perceived cost or with the probability × cost interaction. As a further test of the specificity of perceived probability and cost to worrying, we examined whether perceived probability and cost (and the probability × cost interaction) would predict worrying after having already entered anhedonic depression and anxious arousal in the model. This was done by conducting a hierarchical multiple regression analysis (using centered variables) in which anhedonic depression and anxious arousal were entered in the first step, perceived probability and perceived cost were entered in the second step, and the interaction between probability and cost was entered in the third step. Even after entering anhedonic depression and anxious arousal, the addition of perceived probability and perceived cost significantly improved the prediction of PSWQ scores, and the further addition of the probability × cost interaction also significantly improved the prediction of PSWQ scores. In contrast, parallel analyses revealed that after having already entered PSWQ in the model, perceived probability and cost (and their interaction) no longer predicted anxious arousal or anhedonic depression. The results of these analyses are presented in Table 4.

We next compared those individuals in the sample whose PSWQ scores were in the range typically reported by individuals with GAD (i.e., scores greater than or equal to 65; $N = 39$) with those individuals whose PSWQ scores were below the median of this sample (i.e., scores less than 50; $N = 96$). We conducted a logistic regression analysis predicting group membership, entering probability and cost estimates in the first step, and the probability × cost interaction in the second step (using centered predictor variables). The results of this analysis, presented in Table 5, were consistent with the results of the hierarchical multiple regression analyses reported above. Specifically, the addition of the interaction term significantly improved the prediction of group membership, $\chi^2 = 5.15$, $p < .05$.

The final analysis explored whether the association between worry severity and cost estimates could be accounted for by the association between worry severity and the objectively rated severity of participants' concerns. As one might expect, cost estimates were significantly associated with the objective severity ratings, $r = .41$, $p < .01$. In contrast, however, the objective severity ratings were not significantly associated with worry severity, $r = -.03$, NS. When hierarchical multiple regression analyses similar to those described above were repeated, but with objective severity ratings entered alone on the first step, the results remained essentially unchanged.

Table 4
Summary of hierarchical multiple regression analyses predicting PSWQ, anhedonic depression, and anxious arousal scores, after taking other facets of psychopathology into account

Variable	PSWQ β	Anhedonic depression β	Anxious arousal β
Step 1			
PSWQ	—	.31**	.07
Anhedonic depression	.32**	—	.15
Anxious arousal	.07	.13	—
Step 2			
Perceived probability	.31**	.10	.12
Perceived cost	.16*	.05	−.08
Step 3			
Perceived probability	.29**	.10	.11
Perceived cost	.17**	.05	−.07
Probability × cost	.15*	−.09	.09

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

Table 5
Summary of logistic regression analysis predicting membership in the high PSWQ score group

Variable	Wald χ^2	Odds ratio
Step 1		
Perceived probability	19.67**	2.67
Perceived cost	5.30*	1.75
Step 2		
Perceived probability	15.02**	2.49
Perceived cost	4.38*	1.64
Probability $\times$ cost	5.18*	1.74

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

Discussion

We found that individual differences in the life domains about which individuals are concerned was not strongly associated with worry severity. This is not surprising given that the results of past research have not revealed consistent differences between individuals with GAD and controls in the life domains about which they worry. In the present study, only the number of interpersonal concerns was significantly associated with worry severity. Although this finding is consistent with theorizing and research linking GAD with interpersonal factors (e.g., Borkovec, Newman, Pincus, & Lytle, 2002), it is worth noting that: (a) past research has not found differences between individuals with GAD and controls in the likelihood of their worrying about interpersonal factors; and (b) the magnitude of the association in the present study was not large. It should be pointed out that the results of the present study do not rule out the possibility that there are other aspects of individuals' concerns that may be associated with worry severity. Whereas the present study focused on the life domains about which individuals were concerned, there are other aspects of individuals' concerns, such as how far in the future the undesirable outcomes may occur and whether the worries focus on what would be considered minor matters; in fact, past research has found that such aspects of individuals' worries are associated with GAD (e.g., Brown, Moras, Zinbarg, & Barlow, 1993; Dugas et al., 1998; Hoyer, Becker, & Roth, 2001; Sanderson & Barlow, 1990).

As predicted, individuals with higher levels of worry severity perceived the outcomes they were concerned about as being both more probable and more costly. Previous research examining hypothetical events also found that higher estimates of probability and cost are associated with worry severity (Butler & Mathews, 1983, 1987; MacLeod et al., 1991). In contrast, examining worries from people's own lives (rather than hypothetical outcomes), Craske et al. (1989) did not find an association between worry severity and probability estimates. One possible explanation for the discrepant results between the Craske et al. (1989) study and the three previous studies that did find associations between probability estimates and worry severity is that differences in probability estimates are found only when examining hypothetical outcomes and not when examining real concerns from people's own lives. This explanation does not seem likely, however, because the present study examined concerns from people's lives rather than hypothetical events, and we did find an association between probability estimates and worry severity. We posit that the discrepancy may be accounted for by the finding of the present study that cost estimates moderate the impact of probability estimates. Specifically, we found that the impact of probability estimates increased as cost estimates increased. The costs of many of the hypothetical events utilized by Butler and Mathews (1983, 1987) and MacLeod et al. (1991), such as getting stomach cancer, would be expected to be quite high. Thus, it is possible that the discrepancy in the results of Craske et al. (1989) on the one hand and Butler and Mathews (1983, 1987) and MacLeod et al. (1991) on the other, lies not in whether the concerns were hypothetical or taken from people's own lives, but rather in the average perceived cost of the outcomes they examined. Some of the data relevant to the cost/severity of the outcomes examined across studies are consistent with this hypothesis. In the present study, the mean cost (how upset) rating was 5.7 on a 1–7 point scale, and in Butler and Mathews (1983) the

mean cost (how bad) rating, averaged across groups, was 5.5 on a 0–8 point scale. Although Craske et al. (1989) did not measure cost per se, they did ask participants to report the "maximum aversiveness of the content of the worry," and the mean rating, averaged across groups,[2] was 4.0 on a 0–8 point scale.[3] Thus, it appears that in those studies that found an association between worry severity and perceived probability, the levels of perceived cost may have been greater than in the one study that did not find an association between worry severity and perceived probability.

The results of the present study suggest that both probability and cost estimates are associated with worry severity. Our study also provides the strongest evidence gathered to date that, as predicted by Carr (1974), the impact of probability and cost estimates are not merely additive but in fact interact to predict worry. This is important because it may help explain when probability estimates will and will not predict worrying. Although we posit that high perceived probabilities and costs contribute to greater worrying, the correlational nature of our study prevents us from being confident about the direction of the causal arrow or whether they are causally related at all (since the association could be accounted for by a third factor). Thus, it will be important for future research, employing longitudinal designs and true experiments, to test the issue of causality.

If probability and cost estimates do contribute to worrying, it will be important for future research to determine why it is that some individuals tend to think that their concerns are more probable and costly. Our finding that elevated probability estimates are associated not only with worry, but also with anhedonic depression and anxious arousal, suggests that whatever contributes to elevated probability estimates is common to many (if not most or all) forms of psychological distress. Thus, it seems rather plausible that elevated probability estimates are influenced by elevated levels of neuroticism/trait negative emotionality, diminished levels of self-esteem, or other variables associated with neuroticism and/or self-esteem. In contrast to probability estimates, elevated cost estimates, as well as the probability × cost interaction, were specifically associated with worry severity. One potential explanation for elevated cost estimates, that worriers tend to be concerned about more (objectively) severe future outcomes, does not seem particularly likely given the results of the present study indicating that perceived cost estimates continued to be associated with worry severity even after taking into account objective ratings of the severity of participants' concerns. We hypothesize that elevated cost estimates are associated with maladaptively high goal investment and/or personal standards, which are not common to all forms of psychological distress. The hypothesis that cost estimates are associated with goal investment is consistent with the results of research by Pomerantz and colleagues, who have found that higher levels of goal investment are associated with more worrying, and that this link is mediated by participants' predictions of how upset they would be were they to not achieve their goals (Eaton & Pomerantz, 1999; Pomerantz, Saxon, & Oishi, 2000). The hypothesis that high standards may contribute to high cost estimates and hence to worrying is consistent with the finding that heightened perfectionism, which one might expect to be associated with having high standards, is associated with heightened worrying (Stober & Joormann, 2001). Of course, there are other possible explanations for cost estimates being specifically associated with worrying, such as cost estimates being driven by intolerance of uncertainty (which itself has been found to be specifically associated with worry and GAD; Dugas et al., 2004).

The results of the present research highlight the potential clinical utility of targeting estimates of perceived threat, including cost estimates, when treating individuals with elevated levels of worry. Foa, Franklin, Perry, and Herbert (1996) found that reductions in cost estimates for social events mediated clinical improvement in a sample of individuals receiving cognitive behavioral therapy for the treatment of social phobia. We hypothesize that targeting exaggerated cost estimates will be useful not only in treating individuals with social phobia, but in treating all individuals for whom worrying plays a prominent role, including individuals with GAD. Besides the finding of the present study that cost estimates are associated with worry severity, there are two additional reasons, albeit indirect and speculative, to believe that individuals with GAD are prone to have exaggerated cost estimates. First, we have observed, anecdotally, that many of the clients with GAD to whom we have provided cognitive behavioral therapy have exaggerated cost estimates. Second, past research has

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[2]It is worth noting that although Craske et al. (1989) reported that controls and individuals with GAD did not differ significantly in their maximum aversiveness scores, the effect size was moderate in magnitude ($d = .60$).

[3]The studies by Butler and Mathews (1987) and MacLeod et al. (1991) did not obtain any measures of cost/severity.

found that social phobia, in which exaggerated cost estimates have already been implicated, is the disorder most likely to be comorbid with GAD (Brown, Campbell, Lehman, Grisham, & Mancill, 2001). Thus, even though non-threat-specific processes, such as intolerance of uncertainty, undoubtedly play a critical role in GAD, we posit that targeting perceived threat, particularly cost estimates and factors that may contribute to exaggerated cost estimates, will be beneficial in the treatment of individuals with GAD.

In the present study, we asked participants to describe the undesirable outcomes that they thought about most often. We cannot rule out the possibility that participants would have provided different descriptions had we instead asked them to describe their worries. Three reasons we think this is unlikely, however, are that: (a) what we asked participants to do matches the way we (and we suspect most others) would describe the content of worries (i.e, as concerns about undesirable outcomes); (b) the kinds of concerns participants described resembled what was obtained in past research that asked participants to describe their worries; and (c) the results of our analyses examining concerns were generally consistent with those of past research (i.e., few associations between severity of worrying and the life domains about which participants reported worrying). Even though we found that objective ratings of the severity of individuals' concerns could not account for the association between severity of worrying and cost estimates, we believe there are a couple of reasons why it would be worthwhile to explore this issue further. First, we believe it is important to determine the strength of the association between the severity of individuals' concerns and their subjective cost estimates in different samples of individuals, rather than assuming that what is found in college students would necessarily generalize. Second, the severity ratings may not have been as sensitive as they ideally could have been. We believe it will be particularly useful to examine the severity of individuals' concerns when taking into account the contexts in which the undesirable outcomes might occur (Monroe & Roberts, 1990; Raghavan, Le, & Berenbaum, 2002).

Participants in the present research were young, mostly European-American, well educated adults. Our findings that worry severity is associated with greater estimates of the probability and cost of undesirable outcomes, and is not strongly associated with the life domains about which individuals are concerned, are consistent with the results of past research that was not conducted with college student samples. Our finding that cost estimates moderated the relation between worry severity and probability estimates had not been tested in prior research, and it will therefore be important to explore the degree to which it generalizes to other populations. There are several reasons to expect the results of the present study to generalize to clinical samples, including: (a) the results of past research indicating that normal and pathological worrying differ quantitatively rather than qualitatively (Ruscio, Borkovec, & Ruscio, 2001); (b) the present sample included a modest number of individuals whose levels of worry severity were rather high; and (c) the results of analyses using an extreme group approach were consistent with the results of regression analyses using the entire sample. Nonetheless, we believe it will be important to verify empirically that the findings of the present study generalize to clinical samples.

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