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Shorter communication

Perceived threat: Exploring its association with worry and its hypothesized antecedents

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Abstract

Two studies with college student participants (*n*'s = 262, 239) examined the relation between perceptions of threat (i.e., perceptions of the probabilities and costs of future undesirable outcomes) and: (a) worry; and (b) hypothesized antecedents of perceived threat. In both studies, higher levels of worrying were associated with higher perceived probability and cost. In Study 2, the association between perceived threat and worrying remained even when taking into account maladaptive worry beliefs and the desire for predictability; in fact, the relation between worrying and worry beliefs and desire for predictability were moderated by perceptions of threat. Higher levels of perceived probability were associated with perceiving oneself and others less favorably, whereas higher levels of perceived cost were associated with higher standards.

Keywords: Worry; Perceived threat; Probability estimates; Cost estimates

Introduction

As stated by Borkovec, Alcaine, and Behar (2004), "it is the perception of threat that initiates the anxiety process" (p. 81). Perceptions of threat are composed of two critical elements: (a) the perceived probability of an undesirable outcome; and (b) the perceived cost of the outcome should it come true (Carr, 1974; Foa & Kozak, 1986). With one exception (Craske, Rapee, Jackel, & Barlow, 1989), past research has found that individuals who believe that undesirable outcomes are more likely to occur tend to have higher levels of worry than do individuals who believe that undesirable outcomes are less likely to occur (Berenbaum, Thompson, & Pomerantz, 2007; Butler & Mathews, 1983; MacLeod, Williams, & Bekerian, 1991). To date, only two studies have examined the relation between the perceived cost of undesirable events and worrying, with both studies finding that individuals who believe that undesirable outcomes will be more costly tend to have higher levels of worry (Berenbaum et al., 2007; Butler & Mathews, 1983).

Although past research has found that worrying is associated with perceived probability and cost, several important questions remain to be addressed. One issue we began to address in the present research was whether the association between worrying and perceived probability and cost might be artifacts of shared

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variance between perceived probability and cost and other predictors of worry. In the present research we examined whether perceived probability and cost would continue to be associated with worry when taking into account two other factors that have been found to be associated with worry: (a) maladaptive worry beliefs (e.g., Borkovec & Roemer, 1995), such as the belief that worrying is a sign of being a good, responsible person; and (b) intolerance of uncertainty (e.g., Dugas, Schwartz, & Francis, 2004); we specifically focused on that facet of intolerance of uncertainty which is most specifically associated with worry, the desire for predictability (Berenbaum, Bredemeier, & Thompson, in press).

There were two reasons for examining maladaptive worry beliefs and the desire for predictability (as opposed to other potential correlates of worry). First, past research has consistently found that these two factors are associated with worry. Second, we had some theoretical reasons to suspect that the associations between worry and worry beliefs and the desire for predictability might depend on (i.e., be moderated by) the level of perceived threat. We posited that when perceived threats are significant, individuals will be predisposed to worry regardless of their worry beliefs. In contrast, when perceived threats are low, worry beliefs will primarily drive worry. For example, in the absence of perceived threat, most individuals would probably consider worrying to be less important, whereas individuals with maladaptive worry beliefs would still be inclined to worry. Consequently, worry beliefs would be less strongly associated with worrying when perceived threat is high than when perceived threat is low.

We also had reason to expect the association between worry and the desire for predictability to depend on level of perceived threat. We posited that the relation between worry and the desire for predictability would be greatest when perceived threat was high. When perceived threat is high, individuals with low desire for predictability will be better able to tolerate not knowing whether the undesirable outcome will actually occur. On the other hand, individuals with a high desire for predictability will be more strongly affected by not knowing whether the undesirable outcome will occur. At the limit, when perceived threats are absent and there are no uncertain undesirable outcomes about which to worry, we would not expect any association between worry and the desire for predictability.

If, as we and others hypothesize, perceptions of threat contribute to worry, it is important to elucidate the factors that contribute to perceptions of threat. Therefore, the present research also examined several additional factors that we hypothesize contribute to perceived threat and hence (at least indirectly) to worry. We hypothesized that individuals who perceive themselves as being less competent, and who perceive others as being more malevolent (and less benevolent) would be more likely to expect undesirable outcomes to occur. We also hypothesized that individuals who have higher standards (i.e., what one expects of oneself and believes one ought to do) would expect the costs of undesirable outcomes to be greater. The rationale for this hypothesis is that the higher is one's standards, the greater will be the discrepancy between the undesirable outcome and the outcome one is striving for, and hence the greater will be the perceived cost. For example, getting an F on an exam will seem much worse (i.e., more costly) for a student who thinks she/he ought to get an A than for a student who thinks s/he ought to get a C.

To summarize, the present research focused on perceptions of threat. We hypothesized that greater degrees of worrying would be associated with perceiving the likelihood and cost of undesirable outcomes as being greater. We further hypothesized that these associations would not be artifacts of shared variance with two other correlates of worrying, namely maladaptive worry beliefs and the desire for predictability. In addition, we hypothesized that the associations between worry and both worry beliefs and the desire for predictability would be moderated by perceived threat. We also hypothesized that worry would be associated with: (a) perceptions of oneself and others, with the link being mediated by perceived probability; and (b) standards, with the link being mediated by perceived cost.

Study 1

Method

Participants and procedure

Participants were 262 university students (63.0% female) between the ages of 18 and 22 ($M = 18.6$; $SD = 0.8$). Of those participants reporting their race/ethnicity, the majority (74.0%) reported being European

American, 9.9% reported being Asian American, 5.3% reported being African American, and 4.6% reported being Latina/o. Participants were tested in groups of 10 or fewer individuals. Participants received partial credit toward a research participation requirement in exchange for completing the instruments described below.

Measures

Worry.[1] Worry was measured using the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). The PSWQ is composed of 16 items (e.g., "My worries overwhelm me"). Past research has indicated that the PSWQ has excellent test-retest reliability and good convergent and discriminant validity (Meyer et al., 1990; Nitschke, Heller, Imig, McDonald, & Miller, 2001). In the present sample, alpha for the PSWQ was .96. Scores on the PSWQ ranged from very low (16) to extremely high (80), with a mean of 50.2 (SD = 14.9). Individuals with high PSWQ scores were not rare; 25 participants had scores greater than 70.

Perceived threat. To measure perceived threat, participants were asked to indicate "how likely" (0 = not at all likely; 6 = almost certain) it was that each of 39 outcomes (e.g., "your health deteriorating," "making a mistake at work") were to occur, and "how bad" (0 = not at all bad; 6 = horrific) it would be were each of the 39 outcomes to occur. This strategy of measuring perceived threat was used previously (Butler & Mathews, 1983; MacLeod et al., 1991). The undesirable outcomes included in this instrument included several from each of the major sources of worry identified in past research (e.g., interpersonal, achievement, financial, and health). The average of the 39 "how likely" scores was used as a measure of participants' probability estimates, and the average of the 39 "how bad" scores was used as a measure of participants' cost estimates. Alphas of the probability and cost estimate scales were both .95.

Hypothesized antecedents of perceived threat

Perceived competence. To examine perceived competence, we measured both trait competence and role competence. The trait competence questionnaire was composed of 15 desirable adjectives (e.g., bold, intelligent, responsible, conscientious, successful); participants indicated the degree to which each adjective described themselves (0 = not at all descriptive of me; 4 = extremely descriptive of me). This instrument included traits relevant to each of the big five personality dimensions (e.g., Goldberg, 1993), as well as the domain of achievement. We averaged across the 15 adjectives to compute a total trait competence score. This method of measuring perceptions of self (i.e., having participants rate themselves on a variety of different traits) has been used by numerous researchers (e.g., Beck, Steer, Epstein, & Brown, 1990; Sarason, Pierce, Shearin, Sarason, & Poppe, 1991). Alpha on the trait competence questionnaire was .86. On the role competence questionnaire, participants indicated how competent (1 = not at all competent; 7 = extremely competent) they considered themselves to be on up to 11 different roles (son/daughter, brother/sister, parent, best friend, friend, romantic partner/spouse, student, employee, and 3 additional roles of their choosing; participants were asked to indicate which roles were not applicable). We averaged across the role competence ratings to compute a total role competence score. Alpha on the role competence questionnaire was .61.[2] As expected, the trait competence and role competence questionnaires were significantly correlated, $r = .62$, $p < .01$; consequently, we averaged across the standardized trait competence and role competence scores to compute a composite trait/role competence score.

Others' benevolence. In addition to having participants rate how they perceived themselves, we also had them rate their perceptions of others. Participants rated the degree to which they considered both "people you know well" and "strangers" to have a variety of different traits. There were 16 different traits (e.g., sympathetic, cruel, reliable, incompetent), each of which were rated (1 = not at all descriptive; 5 = extremely descriptive) for both people they knew well and strangers. A total benevolence/malevolence score was computed by summing across all 32 items. Undesirable traits were reverse coded, so that higher scores reflect greater perceived benevolence (and lower perceived malevolence). Alpha in this sample was .71.

[1]Two other facets of psychopathology, anhedonic depression and anxious arousal, were also assessed, but are not presented in detail due to space limitations. As found by Berenbaum et al. (2007), perceived probabilities were associated with all three facets of psychopathology, whereas perceived costs were specific to worry.

[2]It was not possible to estimate alpha using all of the roles since it was uncommon for individuals to rate their competence on all of the roles; the alpha of .61 is based on those 166 individuals who rated their competence on all roles other than parent.

Standards. Standards were measured using a 25-item questionnaire that asked participants to indicate how they ought to be. Sample items are (a) In order to be a good friend, I ought to listen patiently to my friends' problems: always/almost always/usually/about half the time/about a quarter of the time; and (b) In order to be a responsible person, I ought to be late: never/almost never/rarely/infrequently/once in a while. Items relevant to both the achievement (e.g., work) and interpersonal (e.g., friend) domains were included. The generation of items was influenced primarily by our clinical experience with individuals with generalized anxiety disorder. Scores were averaged across the 25 items in such a way that higher scores reflect having higher standards. Alpha in this sample was .81.

Results

Correlations among all variables are presented in Table 1. We tested our hypotheses by conducting path analyses using AMOS 6.0. As can be seen in Fig. 1, as expected, both perceived probabilities and costs were significantly associated with worry. There was no evidence of a probability *X* cost interaction significantly improving the prediction of worry beyond the independent contributions of probability and cost.

Also as expected, perceptions of self and others were associated with perceived probabilities, and standards were associated with perceived costs. The link between perceived competence and worry was only partially mediated by perceived threat. In contrast, the addition of direct links from standards and perceptions of others to worry did not significantly improve model fit.

The model illustrated in Fig. 1 fit the data far better than alternative models in which either: (a) perceptions of self and others led to costs rather than probabilities, and standards led to probabilities rather than costs; or (b) standards and perceptions of self and others mediated the links from probabilities and costs to worry.

Study 2

Study 2 had three major goals: (a) test whether the results of Study 1 could be replicated; (b) test whether perceived threat would continue to be associated with worry when taking into account two other factors that have been found to be associated with worry: maladaptive worry beliefs and the desire for predictability; and (c) test whether perceived threat would moderate the links between worry and maladaptive worry beliefs and the desire for predictability.

Method

Participants and procedure

Participants were 239 university students (58.8% female) between the ages of 18 and 23 ($M = 19.0$; $SD = 0.9$). Of those participants reporting their race/ethnicity, the majority (75.5%) reported being European American, 9.7% reported being Asian American, 5.1% reported being Latina/o, and 4.6% reported being African American. Participants were tested in groups of 10 or fewer individuals. In exchange for completing the instruments described below, participants received partial credit toward a research participation requirement.

Table 1
Correlations among the variables in Study 1

	Probabilities	Cost	Perceived competence	Others' benevolence	Standards
Worry	.20**	.45**	−.23**	−.05	.15*
Probabilities	—	.07	−.25**	−.21**	−.02
Cost		—	.01	−.09	.36**
Perceived competence			—	.28**	.23**
Others' benevolence				—	.19**

*$p < .05$; **$p < .01$.

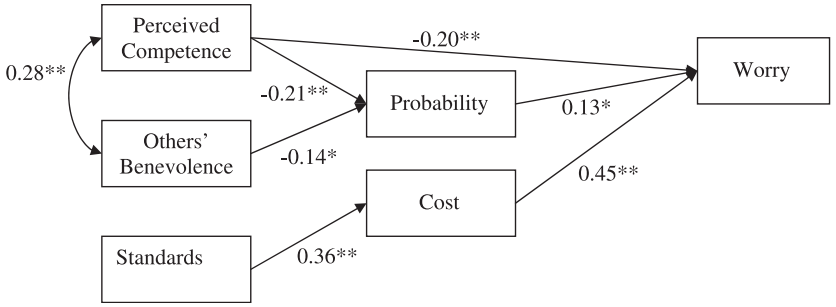

Fig. 1. Path analysis predicting worry in Study 1.

Measures

Worry. Worry was measured using both the PSWQ (see Study 1) and the Worry Domains Questionnaire (WDQ; Tallis, Eysenck, & Mathews, 1992). In the present sample, alpha for the PSWQ was .94. Scores on the PSWQ ranged very low (16) to extremely high (80), with a mean of 49.6 (SD = 14.6). Individuals with high PSWQ scores were not rare; 20 participants had scores greater than 70. Like the PSWQ, the WDQ has been found to have good psychometric properties (Stober, 1998). We prepared five new items regarding worry about school, since such worries were expected to be common in a sample of college students; these five items were written to resemble the work domain items in the original WDQ. Because the validity of the socio-political domain items is considered questionable, it was not included in this study. Thus, the WDQ was composed of 30 items (e.g., "I worry that I will lose close friends"). In the present sample, alpha for the WDQ was .94. As expected, the PSWQ and WDQ were significantly correlated, $r = .58$, $p < .01$; consequently we averaged across the standardized PSWQ and WDQ scores to compute a composite worry score.

Perceived threat. The same questionnaire used to measure perceived threat in Study 1 was also administered in Study 2. In this sample, the alphas for probability and cost estimates were .67 and .65, respectively. In addition, we obtained an idiographic measure of participants' probability and cost estimates. Participants were first asked to provide written descriptions of the five things they worried about the most. After doing so, they were asked to indicate (a) how likely they thought it was for each of the outcomes to actually occur (1 = extremely unlikely; 7 = extremely likely); and (b) how upset they would be if each of the outcomes were to occur (1 = not at all upset; 7 = extremely upset). As expected, the two measures of probability estimates were significantly correlated ($r = .36$), as were the two measures of cost estimates ($r = .46$). Consequently we averaged across the standardized probability scores to compute a composite probability score, and across the standardized cost scores to compute a composite cost score.

Additional hypothesized contributors to worry. In addition to examining perceived threat, we measured two additional factors that have been found to be associated with worry.

Worry beliefs. Maladaptive worry beliefs, which have been found to be associated with worry (e.g., Borkovec & Roemer, 1995), were measured using the Why Worry—II (Holowka, Dugas, Francis, & Laugesen, 2000). In the present sample, alpha for this scale was .93.

Desire for predictability. Participants also completed the Intolerance of Uncertainty Scale (IUS; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). We focused on the Desire for Predictability subscale, computed by averaging across seven items, which is described in Berenbaum et al. (in press).[3,4] In the present sample, alpha of the Desire for Predictability subscale was .92.

Perceived competence. Competence was measured using the same trait competence and role competence questionnaires used in Study 1. Alphas for the trait and role competence questionnaires in this sample were .85 and .72,[5] respectively. As expected, the trait competence and role competence questionnaires were significantly

[3] Berenbaum et al. (in press) and the present paper are based on the same sample of participants.

[4] The Desire for Predictability subscale correlated strongly with the IUS total score, $r = .82$, $p < 01$. Thus, not surprisingly, the patterns of results obtained using the Desire for Predictability subscale were quite similar to those obtained using the IUS total score.

[5] It was not possible to estimate alpha using all of the roles since it was uncommon for individuals to rate their competence on all of the roles; the alpha of .72 is based on those 162 individuals who rated their competence on all roles other than parent.

Table 2
Correlations among the variables in Study 2

	Probabilities	Cost	Perceived competence	Others' benevolence	Standards	Worry beliefs	Desire for predictability
Worry	.44**	.51**	−.32**	−.11	.12†	.48**	.50**
Probabilities	—	.18**	−.39**	−.21**	−.05	.11	.13†
Cost		—	.03	−.08	.28**	.28**	.29**
Perceived competence			—	.30**	.21**	−.08	−.09
Others' benevolence				—	.14*	−.17*	−.17*
Standards					—	.04	.12†
Worry beliefs						—	.45**

†$p<.10$; *$p<.05$; **$p<.01$.

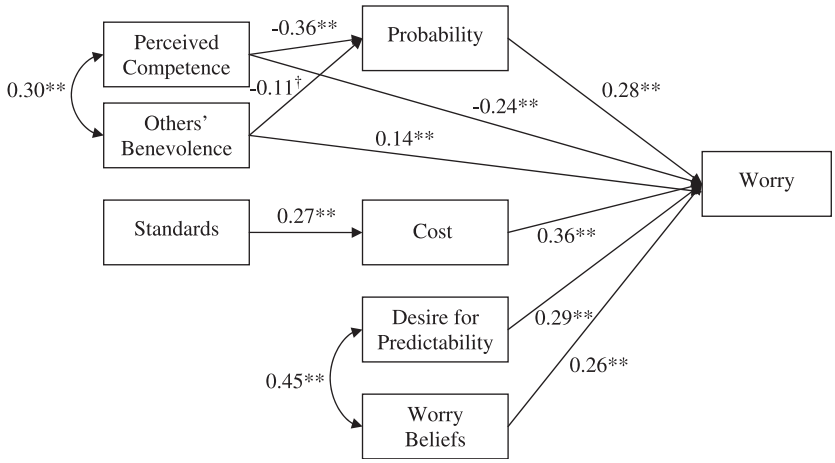

Fig. 2. Path analysis predicting worry in Study 2.

correlated, $r = .62$, $p<.01$; consequently, we averaged across the standardized trait competence and role competence scores to compute a composite competence score.

Others' benevolence. The perceived benevolence/malevolence of others was also measured using the same questionnaire used in Study 1. Alpha in this sample was .87.

Standards. Standards were measured using the same questionnaire used in Study 1. Alpha in this sample was .80.

Results

Correlations among all variables are presented in Table 2. We tested our hypotheses by conducting path analyses using AMOS 6.0. As can be seen in Fig. 2, as expected, replicating the results of Study 1, both perceived probabilities and costs were significantly associated with worry, even when taking into account worry beliefs and the desire for predictability. As in Study 1, there was no evidence of a probability X cost interaction significantly improving the prediction of worry beyond the independent contributions of probability and cost.

As in Study 1, perceptions of self and others, as well as standards, also appeared to be associated with worry. Consistent with Study 1, the link between perceived competence and worry was only partially mediated by perceived threat, and the addition of a direct link from standards to worry did not significantly improve model fit. In contrast to Study 1, a direct link from perceptions of others to worry did significantly improve model fit; however, since the direct link from benevolence of others to worry was in the opposite direction of

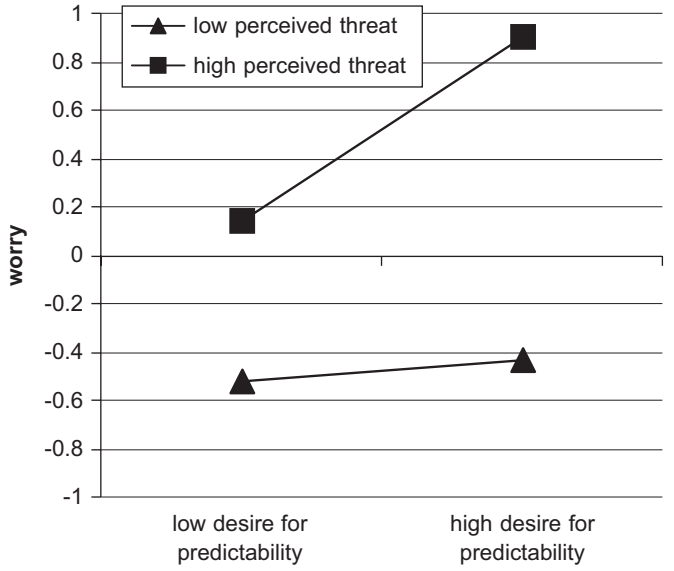

Fig. 3. Perceived threat *X* desire for predictability predicting worry.

what was expected (and the opposite of the zero-order correlation), and had not been found to be significant in Study 1, it should be interpreted quite cautiously. As in Study 1, the model illustrated in Fig. 2 fit the data far better than alternative models.

We also tested the hypothesis that the association between worry and both the desire for predictability and worry beliefs were moderated by perceived threat. To test this hypothesis we computed a composite threat score by summing across standardized probability and cost composite scores. We then conducted a hierarchical multiple regression analysis, using centered variables as predictors. We entered perceive threat, desire for predictability, and worry beliefs in the first step, and the interactions between perceived threat and desire for predictability and between perceived threat and worry beliefs in the second step. The addition of the interaction terms in the second step predicted worry above and beyond the independent contributions of perceived threat, desire for predictability, and worry beliefs, F_{change} (2, 221) = 5.07, $p < .01$. The multiple R was .74, with the addition of the interaction terms accounting for a change in R^2 of .02. 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.

Both interaction terms were statistically significant (perceived threat *X* desire for predictability: $\beta = .17$, $p < .01$; perceived threat *X* worry beliefs: $\beta = -.11$, $p < .05$). We decomposed the significant interactions following Aiken and West (1991). These interactions are depicted visually in Figs. 3 and 4. These analyses revealed that the effects of desire for predictability were diminished when perceived threat was low ($\beta = .15$, $p < .05$) relative to the effects of desire for predictability when perceived threat was high ($\beta = .27$, $p < .01$). The pattern concerning worry beliefs was in the opposite direction. The effect of worry beliefs were diminished when perceived threat was high ($\beta = .20$, $p < .01$) relative to the effects of worry beliefs when perceived threat was low ($\beta = .29$, $p < .01$). In other words, the effects of desire for predictability were strongest when individuals had high levels of perceived threat, whereas the effects of worry beliefs were strongest when individuals had low levels of perceived threat.

General discussion

The results of the present research add to a growing body of evidence that perceptions of threat are associated with worry (e.g., Berenbaum et al., 2007; Butler & Mathews, 1983). Although the results of the present research indicate that perceived threat is associated with worry, it is clearly the case that perceived threat alone is not sufficient to account for worry. We found that perceived probability, perceived cost, worry

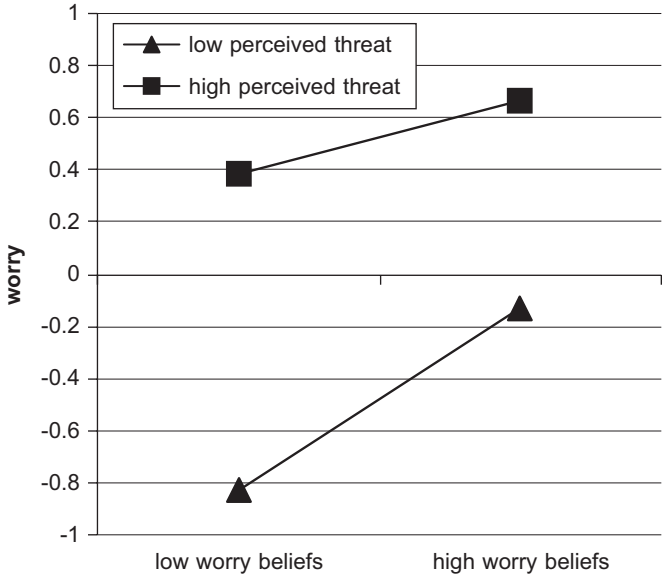

Fig. 4. Perceived threat *X* worry beliefs predicting worry.

beliefs, and the desire for predictability were all associated with worry even when taking each other into account. This suggests that all of these factors will need to be included in any comprehensive model of worry. And, given that even the four predictors were not able to collectively account for all of the variance in worry (though they did collectively account for 53% of the variance), it will be important to also include other factors in a comprehensive model. A comprehensive model of worry will not only need to determine which factors play a role in the development of worry, it will have to explain how and when the different factors contribute. The finding that perceived threat moderates the contributions of worry beliefs and the desire for predictability to worry, and does so in very different ways, raises the possibility that there may be alternative paths to worry. One path to worry may begin with perceived threat that can be exacerbated by a strong desire for predictability (and perhaps other factors as well), whereas a second path may simply be a strong motivation to worry, even when threat is low, caused by maladaptive worry beliefs.

In the present research, we began examining some hypothesized antecedents of perceived threat. As we expected, individuals who perceived themselves as less competent and others as being less benevolent (and more malevolent) tended to have higher levels of perceived probability. Also as expected, individuals who had higher standards tended to have higher levels of perceived cost. In addition to finding that factors such as perceived competence were associated with perceived threat, as had been expected, we also found that the links between worry and factors such as perceived competence were at least partially mediated by perceived threat.

Although the results of the present research have provided some indication of several factors that likely contribute to perceived threat, there are undoubtedly additional factors, such as the tendency to catastrophize (e.g., Davey & Levy, 1998) and attentional biases (see Mogg & Bradley, 2005, for a recent review), that also contribute to perceived threat. Thus, a great deal of additional research is clearly needed in order to elucidate the factors that contribute to perceived threat.

The results of the present research have several potential implications for the treatment of worry. First, the results suggest that targeting perceived threat may be beneficial. Foa and Kozak (1986) suggested that exposure in the absence of negative consequences could reduce probability estimates, and that habituation of anxiety during exposure could reduce cost estimates. In our own treatment of individuals with worry problems, we have found that comparing anticipated probabilities and costs with actual probabilities and costs during exposure can help modify exaggerated perceptions of threat. Second, the findings concerning the moderating influence of perceived threat suggests that it may be especially valuable to target the desire for predictability when perceived threat is high, whereas it may be especially valuable to target maladaptive worry beliefs when perceived threat is low. Finally, the results suggest several potential targets of intervention, such

as perceived competence, which are likely to contribute to perceived threat and hence to worry. Altering inaccurate perceptions of self and others is a common element of several cognitive behavioral interventions (e.g., Beck, Rush, Shaw, & Emery, 1979).

Although the results of the present research are consistent with our hypotheses that perceived threat contributes to worry, and that perceptions of self and others as well as standards contribute to perceived threat, the cross-sectional correlational nature of the two studies we conducted prevents us from being confident of any causal relations among these variables. Only future research employing longitudinal designs and true experiments (in which hypothesized causal factors are manipulated in laboratory settings) will enable us to be confident of which variables actually contribute to which other variables. Both studies in the present research were conducted with college student samples. It will therefore be important to test whether our findings will generalize to other populations. It will also be important to test whether our findings will generalize to clinical samples, though the results of past research indicating that normal and pathological worrying differ quantitatively rather than qualitatively (Ruscio, Borkovec, & Ruscio, 2001), lead us to expect that they very probably will.

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