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# Trait Anxiety and Pessimistic Appraisal of Risk and Chance

Joachim Stöber

Department of General Psychology, Biological Psychology, and Cognitive Psychology,

Free University of Berlin, Habelschwerdter Allee 45, D-14195 Berlin, Germany

## Summary

Previous research on anxiety and risk primarily focused on the subjective probability of negative events. Prevalent definitions, however, regard risk as having two dimensions: (1) probability and (2) utility. Furthermore, previous results remained ambivalent to whether inflated subjective risk was due to trait or to state anxiety. Finally, response-set explanations often could not be ruled out. This article presents two studies in which risk appraisal was investigated with a new text-completion method. Participants were given texts about various possible negative and positive events with omissions for the two risk dimensions. A musical mood-induction procedure was used to induce state anxiety. The participants then completed the texts by choosing the most plausible risk descriptions. Results of both studies show a global effect of trait anxiety on the appraisal of probability and utility for both positive and negative events whereas neither state anxiety nor control variables like social desirability or depression could explain any variance in the appraisal of risk and chance.

# Trait Anxiety and Pessimistic Appraisal of Risk and Chance

In Oatley and Johnson-Laird's (1987) influential cognitive theory of emotions, anxiety is a basic emotion that is elicited when a background self-preservation goal is perceived at risk. However, since emotions also influence a person's cognitive functioning (Lazarus, 1991), anxiety might influence perceptions too, particularly perceptions as to whether something is at risk. Looking at approaches that put their emphasis mainly on individual differences, one prevalent theoretical system accounting for the differences in cognitive functioning is Beck's schema theory. Originally formulated for depression (Beck, 1976), this cognitive approach later was extended to the realm of anxiety (Beck & Emery, 1985). The importance of a schema for a person's way of information processing is summarized by Kendall and Ingram (1987, p. 90): "A schema represents an individual's life experiences stored in a fashion that is cohesive and influential, filtering perceptions and guiding judgments. This structure serves as a mechanism for viewing the self, others, the past, the present, and the future." Whereas the depressive schema involves thoughts of loss and failure, individuals who are vulnerable to anxiety are characterized by the schema of threat and danger as the predominant concepts (Beck & Clark, 1988). This brings the anxious person to focus on psychological and/or physical danger to the person or to something valued by the person. Likewise, when it comes to the appraisal of risk, this schema is likely to guide the anxious person's judgments. Previous research has demonstrated that high-anxious individuals broadly scan their environment for stimuli that might signal possible dangers and upon detection show a tendency to selectively focus on the threat-related stimulus while ignoring emotionally neutral information. Additionally, anxious individuals are more likely to choose a threatening interpretation when presented with ambiguous information (cf. Eysenck, 1992 for a comprehensive review). In combination with this

interpretative bias, the "hypervigilance" (Eysenck, 1992) in anxiety may eventually lead to an increased sense of vulnerability so that, when asked to elaborate on possible future developments, the stories that an anxious person will have to tell would contain many imminent risks and dangers and thus lead to different problem-solving strategies when confronted with a risky environment (Schönpflug, 1989; Stöber, 1996). In summary, compared to low-anxious individuals, high-anxious individuals live in a world of inflated subjective risk.

In previous research on anxiety and subjective risk, evidence broadly consistent with the ideas outlined above were found. Butler and Mathews (1983) examined anxious patients, depressed patients, and controls with respect to their answers in a questionnaire with various items that described negative and positive events (e.g., "if you had to ask a bus conductor to change a £5 note he would be rude to you"). Items were balanced for reference: every item was presented in one version with reference to oneself and in a second version with reference to some other person with no obvious connection to oneself ("if somebody you don't know had to ask a bus conductor . . ."). The subjects (Ss) had to rate each item's subjective probability on a scale from "not at all likely" to "extremely likely". Whereas results showed no group differences for the positive items, there was a marked group effect for the negative items moderated by a significant groups × reference interaction. Compared to controls, both patient groups showed an inflated appraisal of subjective risk for negative events that was particularly pronounced for the self-referent formulations of the items. Collapsed across self-referent and other-referent, however, the anxious patients' ratings for the negative events were below the ratings of the depressed group. In a following study, Butler and Mathews (1987) presented a subjective probability questionnaire similar to Butler and Mathews' (1983) to two groups of university students. The authors used a natural state-anxiety induction procedure as

one group was expecting an examination that was of great importance because it was the sole determinant of grades at that university; the other group had no examination at the time. Both groups were tested twice, one month before (time-1) and one day before (time-2) the one group had their examination. On both occasions, Ss completed a state anxiety inventory and the subjective probability questionnaire. As expected, only the examination group showed a clear elevation of state anxiety at time-2 compared to time-1. With respect to the probability ratings, there was a significant groups × time interaction for the ratings of the negative events, but none for the positive events. The Ss awaiting examination and therefore showing elevated levels of state anxiety gave higher probability ratings for negative events relative both to their own time-1 measure and to the measure of the control group. At time-2, this was modified by a significant interaction effect with reference and content (i.e. miscellaneous items vs. items relating to examinations) indicating that state anxiety rather had a local effect with higher ratings only for the negative self-referent items that were related to examinations. An analysis with trait anxiety as the grouping factor, however, revealed a global effect on all self-referent items: in the high trait-anxious group, negative self-referent items were associated with higher probabilities and positive self-referent items with lower probabilities when compared to the low trait-anxious group. Hence, Butler and Mathews (1987, p. 559) concluded that "high trait anxiety is associated with relatively global effects in the sense that these are observed in items not of immediate concern to the subjects". Yet, a later study by Constans and Mathews (1993) demonstrated that global effects are not necessarily restricted to trait anxiety. In their first experiment, they investigated the effect of mood on the subjective risk of future events. Ss had to imagine a set of either negative events (group 1) or positive events (group 2) resulting in a more negative mood (e.g., more worried and more nervous) in group 1 compared to group 2.

After that, the Ss received two sets of self-related events that were either positive or negative with the instruction to rate for each event the likelihood that it would happen to themselves. The results revealed a global effect of mood on risk judgments: relative to the Ss in a positive mood, the Ss in an anxious mood gave both higher probability ratings for negative self-relevant events and lower probability ratings for positive self-relevant events indicating that even low levels of state anxiety, as is the case in an anxious mood, as well can have a global effect on the appraisal of subjective risk.

Still, the conclusion that elevated levels of anxiety are related to an inflated risk perception is not as firm as it might appear from the above research. In this respect, I would like to put forward three points worth considering. First, risk is a concept that has different dimensions so that results might point to different interpretations depending on the focal dimension of a study. Secondly, it is still relatively unclear "which" anxiety is related to a global inflation of subjective risk, namely trait anxiety or state anxiety, or both. Thirdly, all three studies did not put emphasis on protection procedures that could rule out or at least diminish the plausibility of "demand" or response-set explanations of their results. With respect to the first point, Vlek and Stallen (1980) give an overview of the aspects to be considered in the study of risk. In their work, they provide for a set of formal definitions of risk which are common in risk research and decision theory. Taking the three most common definitions, risk can be defined as the probability of a potential loss (definition 1), the size of a potential loss or, when subjectively evaluated, its negative utility, (definition 2), or a usually multiplicative combination of probability and negative utility called expected loss (definition 3). Most studies of anxiety and risk, however, only regard risk as the probability of a negative event (i.e., definition 1). The state of affairs concerning anxiety and risk according to the definitions 2 and 3 is still largely undecided. Nevertheless, an investigation of these two would be important

because there are seemingly contradictory results from the area of emotion research with respect to positive affect and risk perception: on one side, there are findings that individuals in a positive affective state tend to give lower estimates of subjective probabilities for negative events (e.g., Johnson & Tversky, 1983) while on the other side, there are studies that demonstrate that individuals in a positive mood show higher negative utilities for losses (Isen, Nygren, & Ashby, 1988). With respect to "risk", the results of these studies would lead to opposite conclusions. The results of Johnson and Tversky's studies could be interpreted in the way that positive affect leads to lower risk estimates (risk according to definition 1) whereas the results of Isen et al.'s studies would suggest that positive affect leads to higher risk estimates (risk according to definition 2). Combined, these two contrary effects might even cancel out: when multiplying the lower estimates of subjective probability given by Ss under positive affect with their higher estimates of negative utility, this might result in estimates of expected loss (risk according to definition 3) that would not differ at all from the estimates of expected loss of Ss in a neutral affective state although the latter would show different risk estimates for probability and utility. Consequently, to get a more comprehensive picture of the relationship between affect and risk for the more specific domain of anxious affect, one has to regard the judgments of probability and utility simultaneously. To my knowledge, there are only two studies that explicitly deal with anxiety and utility (subjective cost respectively). One is the study by Gaul (1977) who let his Ss choose between different lotteries. He concluded that low trait-anxious individuals mainly regarded the probability to win whereas high trait-anxious individuals directed their attention to the size of a possible loss. Since the research on gambling allows only limited conclusions for the psychology of everyday risks (Brehmer, 1987), let's take a second look at the study of Butler and Mathews (1983). In their first study with anxious patients, depressed patients,

and controls, the authors also considered subjective cost. Besides filling in the subjective probability questionnaire, Ss were asked to rate the costs for a number of threatening events described in the questionnaire by indicating on a rating scale "how bad" each event would be for them. In parallel with the findings for subjective probability, both patient groups gave significantly higher mean ratings also for subjective cost relative to the control group. Unexpectedly, the mean of the depressed group again was significantly higher than that of the anxious group. Butler and Mathews (1983) therefore concluded that the tendency to exaggerate subjective cost of threats "may be common to both types of mood disturbances, at least when depression is accompanied by anxiety" (p. 60). Since this argument works both ways -- higher subjective cost only when anxiety is accompanied by depression -- the question of whether anxiety is related to inflated subjective risk regarding risk dimension 2 (i.e. subjective cost or utility) remains undecided. Moreover, there are still questions about whether the elevations of subjective risk described above are effects of trait anxiety, state anxiety, or both. Reviewing the literature on anxiety and performance, Eysenck and Calvo (1992) mention correlations up to .70 between self-report measures of trait anxiety and state anxiety. Consequently, the effects of trait anxiety and of state anxiety in risk appraisal can easily be confused. In addition, when patients are compared to non-patient controls, as it was the case in the study of Butler and Mathews (1983), there is always the rival explanation that patient status, not anxiety, was mainly responsible for the reported differences. Because clinical patients generally could be primed for negative events due to their hospital environment or to the talks of their therapy sessions, negative events could be more easily available to them and therefore more likely (cf. the discussion in Eysenck, 1992, chap. 8). However, in the face of equal findings with normal samples (Butler & Mathews, 1987; Constans & Mathews, 1993), patient status is unlikely to wholly account for the relationship between

anxiety and risk appraisal. Still, anxiety patients usually have higher levels of both trait anxiety and state anxiety. Since Butler and Mathews (1987) also report different results for state anxiety and trait anxiety (cf. above), the specific effects of anxiety disposition versus anxiety state are not yet fully understood. Coming to our third and final point, the above findings are not well protected against "demand" or response-set explanations. Although demand effects are not very likely (cf. Butler & Mathews, 1987, footnote 3), they can hardly be ruled out because when employing methods like, for example, a mood induction by imagining negative and positive events as the independent measure on one hand and probability ratings for the negative and positive events in the subjective probability questionnaire as the dependent measure on the other hand, this might easily give clues as to the experimenters' research hypotheses and put a demand on the Ss to answer accordingly.*

Recapitulating the previous arguments, the main objectives of the two subsequent studies on anxiety and risk are the following. First, a method to assess the appraisal of subjective risk should be employed that includes ratings of both relevant risk dimensions, probability and utility. Secondly, both trait anxiety and state anxiety should be investigated whereas the latter should be experimentally manipulated. Thirdly, all methods used should be chosen with respect to maximally protect the expected anxiety effects against "demand" or response-set explanations. Therefore, a new "text-completion task" was developed that, together with corresponding instructions, would capture

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* At least for the main effects, this might be a possibility worth considering whereas it is unlikely that the Ss could have guessed the more complex interaction hypotheses that were stated in the foregoing research.

individual differences in risk appraisal while being less obvious with respect to the experimental hypotheses.

## Study 1

### Method

#### Subjects

Subjects (Ss) were 68 students (47 women), most of them undergraduate psychology students from the Free University of Berlin. Their average age was 26.2 years (SD = 6.2). In this and the subsequent study, all Ss volunteered for the experiment that was announced as a pilot study on "creativity and memory for text material". Undergraduate psychology students received 1 h course credit for participating.

#### Materials

Text-completion task. Inspired by the methods of Müller and Schönpflug (1995), a set of 20 short texts were written in the first person narrative, describing 15 negative events and 5 positive events that could possibly happen to a typical university student in Berlin (see Appendix). Each text contained two omissions, (1) for the probability of the event and (2) for the utility of the event (i.e., the extent of its positive or negative consequences). An example of a text describing a negative event is the following:

> Friday evening, I was too tired to carry my bicycle upstairs into my apartment. Therefore, I just locked it up in the yard. Although I have a very good lock, somebody tried to steal my bike. The lock resisted, but instead, that person damaged my bike _____ [omission 1]. I should have known better. After all, something like this has happened to me already _____ [omission 2].

For every omission, there were four verbal descriptions of probability and utility respectively given in ascending order of magnitude thus forming a 4-point rating scale. To suit best the narrative flow of the various stories, the verbal description for the

omissions varied from text to text. In the example above, the alternatives for the utility omission (here omission 1) ranged from "a little" (1) to "very much" (4), and the alternatives for the probability omission (here omission 2) ranged from "once" (1) to "quite often" (4). The contents of all the other texts used in Study 1 are found in the Appendix.

Musical mood induction. In order to avoid demand effects with respect to the experimental manipulation of state anxiety, a nonverbal procedure was decided for, namely the musical mood-induction procedure by Albersnagel (1988). In this study, Albersnagel had demonstrated that music alone could induce different moods with differential reliability. For anxious mood, he chose Stravinsky's Rite of Spring, whereas for neutral mood, it was Fauré's Ballad for Piano and Orchestra (op. 19). The effectiveness of Albersnagel's procedures has been confirmed by Shapiro and Lim (1989) who applied them to induce anxious mood which resulted in the expected attentional bias to stimuli presented peripherally under conditions of unpredictability.

Personality measures. Trait anxiety was measured with the trait form of the State-Trait Anxiety Inventory (STAI) by Spielberger, Gorsuch, and Lushene (1970; German version by Laux, Glanzmann, Schaffner, & Spielberger, 1981) whereas, for the manipulation check of the mood-induction procedure, a short form of the STAI state scale (consecutively denoted as STAIS) was constructed by selecting the five items with the highest item-scale correlations according to the test manual (see Laux et al., 1981, p. 26, Tab. 5.1.1.4). To additionally control for a social desirability response-set, the Social Desirability Scale (SDS) by Crowne and Marlowe (1960; German version by Lück & Timaeus, 1969) was administered.

Cover story. Upon entering the test room, the Ss were handed a written instruction that presented the experiment as a pilot study for some future study on "creativity and

memory for text material" and told them that the experimenters needed their help to construct suitable text material for that study. Therefore, they would have to work through a series of texts that each contained two omissions. In order to complete the texts, the Ss were told to imagine that the events would happen to them and then choose for each omission the one of the four alternatives that they would consider the most plausible. Further on, the instruction explained to the Ss that the experimenters were looking for a piece of music that was apt "to support a creative state of mind" in the participants of that future study. Therefore, after listening carefully to a piece of music, the experimenters would ask them to fill out a short questionnaire to check which effect the music had had (denoted as STAIS-1). To further substantiate the cover story for the music, there was an additional item asking the Ss whether they would listen to this piece of music while working or studying.

Procedure

After the Ss had read the above instruction, they were handed a miniature cassette-player with a set of headphones. Ss were randomly allocated to one of the two experimental groups: the anxiety-induction group had to listen to 9 min of Stravinsky whereas the control group listened to 9 min of Fauré. The music was played with a standard volume that had been found neither to loud nor to soft in preexperimental test sessions. After the 9 min of music, the experimenters handed out the shortened STAI state scale (STAIS-1) followed by the question of whether the music would be listened to during work/studying. Immediately thereafter, the Ss worked through the text-completion task. Upon finishing, the Ss once more received the short form of the STAI state scale (denoted as STAIS-2) and finally filled in the two personality questionnaires, the STAI trait scale and the SDS.

The two personality questionnaires were administered after the text-completion task in order to avoid demand effects on the Ss' choices. Consequently, only the manipulation check with the STAIS-1, although its application was covered as to describe the effects of the music, could have given a clue about the experimental hypotheses. To rule out this possibility, the experimenters conducted a short, informal postexperimental interview asking the Ss whether they had any idea about what the real aim of this study was and whether they could formulate any hypotheses for the experiment they had just participated in. However, no S mentioned a possible relationship between the text-completion task and the musical pieces at the beginning and/or the two self-description inventories at the end of the experiment; likewise, no S reported that s/he had been suspicious concerning the background information (cover story) presented in the instruction. Finally, the experimenters revealed the true assumptions to the Ss and explained why the deception (cover story) had been necessary. The Ss were notified that they had the right to withdraw their data from the study without consequences. All 68 Ss gave their permission to keep their data.

## Results

Sample characteristics and manipulation check. Regarding the two personality inventories, STAI trait and SDS, the sample means were $M = 43.03$ ($SD = 9.52$) for trait anxiety and $M = 8.65$ ($SD = 4.06$) for social desirability. With respect to the STAIS-1 that served as the manipulation check of the mood induction, the Ss, who had listened to Stravinsky, described themselves as being in a more anxious state than the Ss, who had listened to Fauré ($t(66) = 3.22$, $p = .001$, one-tailed). After the text-completion task, however, this highly significant difference had vanished ($t(66) = –0.06$, $p = .54$, one-tailed). Table 1 gives the corresponding means and standard deviations (see Study 1, STAIS-1 and STAIS-2).

Anxiety and risk judgments. Despite the successful manipulation, the induction of state anxiety had no effect on the appraisal of risk. By reversing the scores of the choices for the positive texts, the ratings of probability and utility can be summed up across the 20 texts to form a single score of overall risk. As can be seen from Table 1, the means in overall risk do not differ between both experimental groups ($t(66) = 0.08$, $p = .51$, one-tailed) indicating that the Ss in anxious mood did not display a more negative bias in their selections compared to the Ss in neutral mood. Summing the scores separately for (a) probability and (b) utility within (i) negative and (ii) positive texts results in four variables, namely (a.i) probability for negative events (P-NEG), (a.ii) probability for positive events (P-POS), (b.i) utility of negative events (U-NEG), and (b.ii) utility of positive events (U-POS) forming two within-Ss factors, (a/b) risk dimension and (i/ii) valence. After reversing the scores for the positive events to avoid trivial interactions of anxiety and valence, a three-way mixed ANOVA with the factors mood, risk dimension, and valence was calculated.* Still, there were no significant effects; all three interaction

* When expecting a global effect of anxiety on risk appraisal in the way of higher probabilities/utilities for negative events and lower probabilities/utilities for positive events, it is advantageous to reverse the scores for the positive events prior to the calculation of ANOVAs and regression analyses to avoid trivial interaction effects of anxiety × valence. However, if the scores for the positive texts have been reversed and the results still show a significant anxiety × valence interaction, then this interaction would demonstrate that the difference between high anxious and low anxious Ss in the appraisal of risk differ between negative events and positive events, or to put it in other words, that their difference in the appraisal of negative events is of a different magnitude from their difference in the appraisal of positive events.

terms of the between-Ss factor mood with the two within-Ss factors were nonsignificant ($Fs(1, 66) \leq 1.18$, $ps \geq .28$). However, since the completion of all 20 texts takes approximately 30 min and mood inductions are reported to have effects that persist for approximately 15 min (Cartier & Ramieri, 1989), a further analysis was carried out by calculating an overall risk score for the first 10 texts only. Nevertheless, for the first half of the text-completion task, there also was no significant effect of mood ($t(66) = –0.13$, $p = .45$, one-tailed).

A different picture, however, was found for trait anxiety (see Table 2, column 1): the correlation between STAI trait and overall risk was $r = .25$ ($p = .02$, one-tailed). Compared to low trait-anxious individuals, high trait-anxious individuals chose significantly higher degrees of both probability and utility as the most plausible alternatives when the events were negative, whereas they chose significantly lower degrees when the events were positive. These responses were not biased by a social desirability response-set ($r = .01$, $p = .97$).* To test for specificity with regard to risk dimension and valence, multiple regression analyses were conducted with the two within-Ss factors, dimension and valence, as the qualitative predictor variables and trait anxiety as the quantitative predictor variable (cf. J. Cohen & P. Cohen, 1983, chap. 8). This regression analytic approach was preferred over artificially dichotomizing the STAI trait scores to calculate ANOVAs (as it is commonly done by a simple median split into a qualitative variable "high trait-anxious versus low trait-anxious") because the latter usually will reduce statistical power (J. Cohen, 1983). Still, the analyses did not show any reliable interaction effects of trait anxiety with risk dimension and/or valence (all

* Throughout this article, all probabilities $p$ are from two-tailed tests if not indicated otherwise.

three Fs < 1). Therefore, the results do not provide any evidence for specificity with regard to risk dimension or valence (see Table 2, Study 1).

## Discussion

In sum, the induction of anxious mood had no effect on risk appraisal as measured by the text-completion task, neither on the probability scores nor on the utility scores for neither negative nor positive events. As mood effects on the appraisal of risk or, to be more exact, on the appraisal of subjective probabilities for negative events, are rather persistently reported in the literature (e.g., Constans & Mathews, 1993; Johnson & Tversky, 1983; Wright & Bower, 1992), our findings that the induction of anxious mood had no effects are rather surprising and demand a further replication. The significant correlations between trait anxiety and the choices in the text-completion task, however, are in line with the findings of Butler and Mathews (1987) that trait anxiety has a global effect on the appraisal of both negative and positive events. The results with our text method implicate that high trait-anxious Ss seem to consider bad luck as more plausible and good luck as less plausible which could be interpreted as a general pessimistic bias in the trait-anxious individuals' perception of risk and chance. However, before making this conclusion, we have to turn to a problem in the research of anxiety and risk, namely that trait anxiety and depression typically co-occur (Eysenck, 1992, p. 145). Particularly when using Spielberger's measure of trait anxiety, the distinction between the two is not very clear. Because when looking at the items of the STAI trait scale, one can easily detect formulations that appear more closely related to the experience of depression than to that of anxiety, for example, "I feel like crying" (item 23), "I am happy" (item 30, reversed score), or "I feel blue" (item 35). Consequently, the literature on anxiety and depression regularly reports correlations around .60 between self-report measures of trait anxiety and of depression (e.g., Dobson, 1985). To control for depression effects is particularly

important here because some of our texts might be ambivalent to whether they describe threats or losses (cf. Appendix) and consequently to whether they are schema-congruent to anxiety or to depression. Therefore, a second study was conducted not only to replicate the findings of Study 1, but also to safeguard our trait-anxiety results against the alternative explanation that depression might have been the crucial variable.

## Study 2

### Method

#### Subjects

The sample of the second study consisted of 60 Ss (42 women), as before mainly undergraduate psychology students attending the Free University. Average age of the Ss was 27.1 years (SD = 6.2).

#### Materials

Text-completion task. The Ss again received 20 short texts describing events that could happen to a typical university student in Berlin with omissions for probability and utility as described before. In order to balance positive and negative texts this time, five negative events from Study 1 had been randomly chosen and replaced by five new positive events so that there now was an equal number of positive and negative texts. Moreover, positive and negative texts were balanced in the first and the second half of the text-completion task so that the first ten texts and the second ten texts each described five positive and five negative events (cf. Appendix, Study 2).

Personality measures. The trait and state anxiety measures were the same as in the previous study as was the social desirability scale. Additionally, the 13-items short form of the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; German short form by Kammer, 1983) was applied. All other material was exactly the same as in Study 1.

## Procedure

Likewise, the procedure was exactly the same as in Study 1. In the postexperimental interviews, however, a few Ss reported doubts about the validity of the cover story, a fact that is not surprising given the frequent practice of false feedback in stress experiments conducted within the department. Yet, again no S mentioned any hypotheses relating the text-completion task to the music and/or the personality questionnaires. Therefore the data of all 60 Ss were retained for the following analyses.

## Results

Sample characteristics and manipulation check. With respect to the three personality inventories, this time the sample means were $M = 40.97$ ($SD = 9.50$) for trait anxiety, $M = 8.97$ ($SD = 4.25$) for social desirability, and $M = 3.72$ ($SD = 3.24$) for depression. Although the sample mean of trait anxiety in Study 2 was significant lower than that in Study 1, this is unproblematic because equal variances are more important than equal means when calculating correlations (i.e. standardized covariances) and the standard deviation in Study 2 was the same as that in Study 1. The manipulation check for the musical mood-induction procedure again revealed a significant difference between the two groups. As in Study 1, the Ss, who had listened to Stravinsky, described themselves as being more anxious than the Ss, who had listened to Fauré. Here in Study 2, however, this effect, although again significant, was not as pronounced as it was in Study 1 ($t(58) = 1.85$, $p = .035$, one-tailed) and again vanished during the text-completion task ($t(58) = –0.40$, $p = .73$, one-tailed). Table 1 shows the corresponding means and standard deviations (see Study 2, STAIS-1 and STAIS-2).

Anxiety and risk judgments. As in the previous study, the measure of overall risk was calculated by reversing the scores for the positive texts and then summing up all 20 probability choices and all 20 utility choices. Again the manipulation of state anxiety had

no effect on the appraisal of risk. As can be seen from Table 1, the Ss in anxious mood did not show the expected bias in their selections compared to the Ss in neutral mood; like in Study 1, the means of overall risk do not differ between the two experimental groups ($t(58) = 0.14$, $p = .56$, one-tailed). Also, when creating separate values for P-NEG, P-POS, U-NEG, and U-POS (cf. Study 1) and calculating further analyses with the within-Ss factors risk dimension and valence, this again did not result in any significant effects. All three interaction terms of the mixed ANOVA did not reach significance ($Fs(1, 58) \leq 3.98$, $ps \geq .05$). The largest F-value, the one of 3.98, belongs to the mood × valence interaction and only appears to be marginally significant. As this effect was not predicted, a simple Bonferroni correction (Shaffer, 1994) was applied to the critical alpha level in order to reduce the probability of making a Type 1 error. With the three F-tests, the adjusted $\alpha$ is .05 / 3 = .0167 leaving the p-value of this interaction well above the critical alpha level. Besides, as can be seen from Table 1, the corresponding differences, showing higher probabilities for Ss in anxious mood and higher utilities for Ss in neutral mood, are far from being significant (t-tests, $ps \geq .34$). As in the previous study, a second analysis was carried out by calculating an overall risk score across the first 10 texts only; but once more, there was no significant effect of mood ($t(58) = 0.20$, $p = .58$, one-tailed).

With trait anxiety, however, the picture was again quite different (see Table 2, Study 2). Like in Study 1, the correlation between STAI trait and the overall risk score of the text-completion task was significant, here in Study 2 even highly significant ($r = .38$, $p < .001$, one-tailed). Again, social desirability did not impose any substantial bias on the choices in the text-completion task ($r = –.14$, $p = .27$). More importantly, the differences in risk appraisal were not due to the depression component in the items of the STAI trait scale. As expected, the correlation between the STAI trait scale and the Beck Depression Inventory was substantial ($r = .77$, $p < .001$, one-tailed). Nevertheless, the correlation

between the BDI and overall risk failed to reach significance ($r$ = .19, $p$ = .08, one-tailed). Furthermore, partialling out depression did not attenuate the correlation between trait anxiety and risk (partial $r$ = .38) whereas partialling out trait anxiety reversed the correlation between depression and risk (partial $r$ = –.18). Therefore, the correlation between STAI trait and risk appraisal evidently was an effect of trait anxiety and not of depression.

As before, multiple regression analyses were computed with risk dimension and valence as the qualitative predictor variables and trait anxiety as the quantitative predictor variable. Again, these analyses did not show any reliable two-way interaction effects with trait anxiety ($F$s < 1) whereas this time, the three-way interaction effect of trait anxiety × risk dimension × valence was more prominent ($F(1, 58) = 5.10$, $p$ = .03). But, when again correcting the critical $\alpha$ level to .0167 for the same reason and with the same calculations as above, this interaction too failed to reach significance. Still, post-hoc multiple comparisons between the four correlations (i.e. trait anxiety with P-NEG, U-NEG, P-POS, and U-POS, the latter two reversed; cf. footnote 2) were computed using the formulas of Meng, Rosenthal, and Rubin (1992) to avoid making a possible Type 2 error. Still, none of the six pair-wise comparisons was significant ($Z$s ≤ 1.77, $p$s ≥ .08). Because the absolute values of the four correlations of trait anxiety and the risk scores do not differ significantly, the value of $r$ = –.15 between trait anxiety and the appraisal of the positive events merely seems substantially smaller so that the differences between the absolute values of the correlations should not be overvalued (cf. Table 2, Study 2).

## General Discussion

Two studies were presented which addressed the general question of whether high-anxious individuals show a bias in the estimation or subjective risk. Three specific questions were considered: (1) Is it possible to choose methods and a design to

maximally protect the results against alternative explanations like "demand" or response set? (2) Would an effect of anxiety on the appraisal of risk be connected rather with trait anxiety or with state anxiety when the latter is independently manipulated? And above all, (3) does the effect of anxiety on risk appraisal generalize across both risk dimensions given by prevalent risk definitions (Vlek & Stallen, 1980), that is probability and utility? With regard to the first question, it should be mentioned that in personality research one seldom can completely rule out effects due to "demand" or response set. Particularly when using self-descriptive inventories to assess individual differences, this can easily give a clue as to the experimenter's hypotheses. Still, the findings of the two studies are rather well protected against alternative explanations of this kind. First, all the personality measures (the STAI trait scale, the SDS, and in Study 2 also the BDI) were administered after the text-completion task in order not to influence the subjects' choices. Secondly, the participants were only demanded to provide help in the selection of a suitable piece of music and in the construction of plausible texts for some future study on "creativity and memory for text material", thus decreasing the demand to search for the experimental hypothesis of the study they were participating in. Thirdly, a musical mood-induction procedure was used to induce state anxiety. Whereas with verbal procedures like, for example, the popular Velten technique (Velten, 1968), it cannot be ruled out that the Ss would guess the type of mood effect that the experimenter is expecting, this is extremely unlikely with a nonverbal, musical only mood-induction procedure (Martin, 1990). This strong emphasis on ruling out demand effects, appeared to be successful. In both postexperimental interviews, no S mentioned a direct link between the text-completion task and the musical pieces or the personality questionnaires. Still, the present results could only replicate previous findings with trait anxiety inasmuch as only significant correlations with trait anxiety were obtained without corresponding effects for

state anxiety in both Study 1 and Study 2. Whereas these nil findings of course do not indicate that state anxiety is less relevant compared to trait anxiety or even irrelevant, they nevertheless deserve some consideration. Although the musical mood-induction technique of Albersnagel (1988) resulted in significant mood changes in the intended direction, the effects were of only moderate size -- especially when compared to non-experimental, naturally occurring variations in state-anxiety in the face of an important exam (cf. Butler & Mathews, 1987) -- and did not last past the text-completion task. However, when calculating risk scores for the first half of the text-completion task only, the results were unaltered: anxious mood still had no effect on the choices in the text-completion task. There is the possibility that the induced affect might have lasted even shorter than the estimated minimum of 15 min. Yet, in the light of the findings of Albersnagel (1988) and Shapiro and Lim (1989), this is very unlikely. So, the problem is perhaps the use of a nonverbal mood-induction procedure because all three studies that could show that even slight changes in affective state result in respective changes in the appraisal of subjective probabilities (i.e. Constans & Mathews, 1993; Johnson & Tversky, 1983; Wright & Bower, 1992) used verbal mood-induction procedures. Thus, their results might have been caused by a global priming of verbal memory material. Also for the study of Butler and Mathews (1987), it could be argued that the students awaiting the examination were verbally primed for negative material. Future research therefore should clarify whether state anxiety does have an effect on the appraisal of subjective risk also when the events responsible for an elevation of state-anxiety, whether they are experimental procedures or naturally occurring events as in quasi-experimental designs, are not already priming the verbal material used as a measure of risk appraisal.

While the manipulation of state anxiety had no effects, there were marked correlations between trait anxiety and the scores of the text-completion task. In both

studies, high trait-anxious individuals showed an elevated risk appraisal for all events. This replicates the findings of Butler and Mathews' (1987) study in which trait anxiety as well had a global effect on the appraisal of all positive and negative items in the self-referent version. The extension of their results now lies in the fact, that this global effect of trait anxiety was found for both risk dimensions simultaneously, that is for subjective probability (risk dimension 1) and for utility (risk dimension 2). As a logical consequence, there must also be a corresponding effect for expected loss (risk dimension 3) because expected loss usually is defined as some multiplicative combination of the two: if subjective probability (P) and utility (U) both are greater for high trait-anxious individuals compared to low trait-anxious, any multiplicative combination of the form P × U must be greater, too. Whereas P and U are greater when the event is negative and the consequences thus are losses, the pattern is exactly opposite when it comes to positive events. If the event is positive and the consequences thus are gains then both lower subjective probabilities (P-POS) and lower positive utilities (U-POS) are more plausible for high trait-anxious persons. Consequently, any multiplicative combination of the form P-POS × U-POS would be lower, too, and high trait-anxious Ss would show a deflated appraisal of "expected gains". Hence, our results also extend the findings of Butler and Mathews' (1983) study in which they found higher subjective cost for clinically anxious and depressed patients (a) to the realm of non-clinically high-anxious individuals and (b) to the appraisal of positive utilities and expected gains.

In the discussion of their trait-anxiety findings, Butler and Mathews (1987) argue along Beck's schema theory of anxiety (Beck & Emery, 1985). The same line of reasoning holds for the results presented above, thus supporting the notion that there are schemata relating to threat and danger in normal high trait-anxious individuals. Regarding schema-congruent information processing in anxiety (Beck & Clark, 1988),

the results with the text-completion task show that these schemata not only influence the screening, encoding, storing, and retrieving of schema-congruent information, but also the construction of schema-congruent information. Looking at the choices for the text omissions, the high trait-anxious individuals produced stories with higher probabilities and utilities for negative events and lesser probabilities and utilities for positive events. Favoring bad luck and disfavoring good luck, trait anxiety seems to be connected with a general pessimistic bias in the perception of both risk and chance. Consequently, high trait-anxious individuals might have good reasons to keep on worrying (MacLeod, Williams, & Bekarian, 1991): for them, it is easy to imagine that everything goes wrong whether because of a refined construction of negative scenarios, because of an easier recall of similar past events, or because of a facilitated retrieval of previous judgment (MacLeod, 1994). Here, the pessimistic appraisal of risk and chance in high levels of trait-anxiety may be an important factor in maintaining or even enhancing levels of anticipatory anxiety.

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Table 1

Manipulation Checks and the Effects of Mood on the Risk Scores of the Text-Completion Task

| | Study 1 Mood | | | | Study 2 Mood | | | |
|---|---|---|---|---|---|---|---|---|
| | anxious | | neutral | | anxious | | neutral | |
| | M | (SD) | M | (SD) | M | (SD) | M | (SD) |
| State Anxiety | | | | | | | | |
| STAIS-1 | 11.48[b] | (3.41) | 9.14[b] | (2.55) | 10.45[a] | (2.80) | 9.19[a] | (2.47) |
| STAIS-2 | 9.85 | (2.48) | 9.89 | (2.61) | 9.28 | (2.17) | 9.52 | (2.50) |
| Risk Scores | | | | | | | | |
| overall risk | 2.29 | (0.30) | 2.30 | (0.19) | 2.35 | (0.21) | 2.34 | (0.25) |
| P | 2.25 | (0.31) | 2.27 | (0.20) | 2.30 | (0.30) | 2.26 | (0.24) |
| U | 2.34 | (0.34) | 2.33 | (0.25) | 2.39 | (0.26) | 2.45 | (0.24) |
| NEG | 2.28 | (0.34) | 2.26 | (0.24) | 1.99 | (0.36) | 2.13 | (0.31) |
| POS | 2.67 | (0.36) | 2.58 | (0.32) | 2.30 | (0.36) | 2.42 | (0.36) |

Notes. STAIS-1 = state anxiety after the mood manipulation, STAIS-2 = state anxiety after the text-completion task; overall risk = probability and utility scores combined (positive texts reversed), P = probability score (scores of the positive texts reversed), U = utility score (scores of the positive texts reversed), NEG = probability and utility scores combined for negative texts, POS = probability and utility scores combined for positives texts (scores of the positive texts not reversed).

Means sharing the same superscript differ significantly at $^{a}p < .05$, $^{b}p < .01$, one-tailed.

Table 2

Correlations between Trait Anxiety and the Risk Scores of the Text-Completion Task

| | Study 1 N = 68 | Study 2 N = 60 |
|---|---|---|
| overall risk | .25* | .38*** |
| P | .25* | .34** |
| U | .21* | .32** |
| NEG | .18 | .35** |
| POS | –.27* | –.15 |

Note. For an explanation of the abbreviations, see Table 1.

*p < .05, **p < .01, ***p < .001, one-tailed.

Appendix

The 25 Texts Used in the Studies 1 and 2, their Contents, and Their Position in the Text-Completion Tasks.

| | | Position of Text | |
|---|---|---|---|
| | | Study | |
| Text Contents | | 1 | 2 |
| Negative events | | | |
| 1. | When returning from vacations, I find that my flowers have not been taken care of. | 1 | – |
| 2. | When doing some repair work at home, I get an electrical shock. | 3 | – |
| 3. | In a university seminar, I am criticized for giving a rather bad performance. | 6 | – |
| 4. | I experience a religious crisis when taking up my university studies. | 18 | – |
| 5. | My favorite Italian restaurant has a new waiter who treats me in an unfriendly way. | 20 | – |
| 6. | After a misunderstanding, a fellow student of mine does not call me anymore. | 4 | 2 |
| 7. | Overnight, I leave my bicycle in the court, and the bike gets damaged. | 5 | 3 |
| 8. | I find the application form to a training seminar only after the deadline has already passed. | 8 | 6 |
| 9. | After drinking alcohol, I still drive my car and get involved in an accident. | 9 | 7 |
| 10. | After my parents get divorced, my father does not visit me as often as expected. | 10 | 10 |
| 11. | During my vacations, I have a room in a hotel where there is noisy construction work nearby. | 12 | 12 |
| 12. | I have not kept up with my exercises, and my health insurance refuses to pay for a further treatment. | 14 | 14 |
| 13. | I give money to a shady banker who afterwards disappears. | 15 | 15 |
| 14. | I avoid participating in university seminars because of my speech anxiety. | 17 | 17 |
| 15. | The letter I sent does not arrive in time although a post office official said it definitely would. | 7 | 19 |

Appendix (continued)

| | | | |
|---|---|---|---|
| Positive events | | | |
| 1. | I meet my favorite actor in a Berlin bar, and he chats with me. | – | 1 |
| 2. | Together with friends, I organize a big party with the motto "the Middle Ages" that is well accepted. | – | 4 |
| 3. | After years of stomach problems, I get rid of them with some natural remedy. | 19 | 5 |
| 4. | At a get-together, I am asked to perform something on the guitar which turns out to be a success. | 2 | 8 |
| 5. | In a new store, I find some rare music CDs which I have been looking for. | – | 9 |
| 6. | I have to stay in the hospital for three months. Still, many people visit on a regular basis. | 11 | 11 |
| 7. | I buy a lottery ticket on the street and win a price. | 13 | 13 |
| 8. | I buy myself a personal computer, and a friend helps to get things started. | 16 | 16 |
| 9. | While waiting in line for a theater play, I receive two free tickets from a stranger. | – | 18 |
| 10. | I am wearing clothing that I have made myself and receive many compliments. | – | 20 |