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Mood, judgment and the impact of a life event

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MOOD, JUDGMENT
AND THE IMPACT OF A LIFE EVENT

by

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Submitted in partial fulfillment of the requirements
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MOOD, JUDGMENT
AND THE IMPACT OF A LIFE EVENT

Abstract

by

AMIR JASSANI

A study was conducted to investigate how mood affects probability estimation following a naturally-occurring life event. Subjects were undergraduate college students in an introductory psychology class, and the natural life event was the return of graded mid-term examinations. General mood was measured by the Mood-Introspection Scale, and probability estimation was measured by the Probability Estimation Scale. The Life Orientation Test was used to measure dispositional optimism, and the Eysenck scale was used to measure neuroticism. Results showed that returned exams were associated with subjects' responses, with higher exam scores related to more positive mood and more optimistic judgments. Thus, mood and judgment were related to the valence, positive or negative, of the life event. The results failed, however, to show a direct relationship between mood and judgment. The lack of relationship between mood and judgment is in contrast to expectations based on the mood-biased judgment hypothesis (Mayer, 1986), which postulates that good moods tend to relate directly to more positive, optimistic judgments. Possible reasons for the difference between present findings and some prior research is discussed.
Acknowledgments

I would like to thank my advisor and committee chair, Dr. Robert Greene for his guidance and suggestions during the course of this study. I would like to thank, also, Dr. Jane Kessler, Dr. Fred Zimring and Dr. Ehud Koch for their helpful comments as committee members.
Mood, Judgment
and the Impact of a Life Event

This study deals with emotional influences on cognition following a natural life event. The specific cognitive task being studied here is probability judgment, the ability to estimate the likelihood that certain events will occur. A brief review of this task will be given, and then the possible role of emotion in this task will be discussed.

Judgments of Probability

Estimation of the frequency of the occurrence of an event in the past and of the probability that it will occur in the future has been a widely studied area. Tversky and Kahneman (1973) have studied this task in detail and propose two main mechanisms for judging frequency and probability—representativeness and availability. Estimating probability by representativeness involves basing judgments on the similarity of each specific instance to the general category of which it is a member. For example, subjects tend to believe falsely that a specific sequence such as 7 4 1 8 2 is a more likely string of random numbers than 1 2 3 4 5, simply because the haphazard nature of the first sequence seems more typical of random number strings than the orderly nature of the second sequence. Alternatively, judging probability by availability entails rating events as more probable if specific examples of that kind of event can be brought easily
to mind. For example, subjects tend to believe falsely that the
letter N occurs more often in the first position of words than in
the third position simply because it is easier to retrieve words
with N in the first position than words with N in the third
position. Tversky and Kahneman state that "Specifically,
frequency of a class is likely to be judged by availability if the
individual instances are emphasized and by representativeness if
generic features are made salient" (p. 220). They go on to
discuss the potential for bias introduced through use of the
simplifying mechanisms of representativeness and availability, as
would occur, for example, when the recent viewing of an automobile
accident provides a readily available instance in mind, thereby
raising subjective estimates of the likelihood of automobile
accidents.

Thus Tversky and Kahneman (1973) suggest how susceptible
judgments of probability and frequency are to bias. Along this
line, Lichtenstein, Slovic, Fischoff, Layman, and Combs (1976)
studied people's frequency estimates for various causes of death,
such as heart disease and motor vehicle accidents. The
investigators were able to identify two consistent kinds of bias
affecting people's judged frequencies for lethal events: (a)
people tended to overestimate low frequency events and
underestimate high frequency events, and (b) some specific causes
of death such as cancer were overestimated and other specific
causes such as diabetes were underestimated, whatever their
objective frequency. Possible explanation regarding these biases include Tversky and Kahneman's concept of availability. Lichtenstein et al. found that the most overestimated causes of death were likely to be the most dramatic, sensational, and highly publicized, such as motor vehicle accidents, and therefore the most available as relevant instances in memory.

Thus, it is clear that judgments of probability and frequency may be influenced by biases. This study examined the effects of one possible source of bias—mood.

**Effects of Mood on Cognition**

Emotional influences on cognition have been often considered in the psychological literature. Zajonc (1980) discusses the history of thinking in this area and comments that, in general, contemporary psychology regards cognition as preceding emotion. There are numerous theorists who have suggested that the emotion being experienced at a certain time is greatly influenced by the cognitive evaluations the person has made. (The theories of emotion developed by James, 1890, and Schacter & Singer, 1962, may be considered examples.) Zajonc personally takes issue with the idea that cognition necessarily precedes affective experience, arguing instead that affect and cognition are partly independent systems whose independence may have a physiological basis. He states that, in the wide area of preferences, cognition is always accompanied by affect, but affect may involve little or no
cognition.

Bower and Cohen (1982) also explore the nature of the interaction between emotions and thought processes. They differ from Zajonc (1980) in suggesting that situations and stimuli are first processed cognitively. Subjective emotional rules then come into play which give cognitive interpretations their corresponding emotional appraisals. Since emotions are themselves stored within a semantic network, activation from an emotion may spread to connected words and concepts, thereby priming them for conscious availability. Present mood, for instance, may prime connected concepts and memories, which then become the basis for judgments about possible future events. In this way, mood may have important influences on cognitions, and these cognitions may then subsequently influence mood. Some evidence for this assertion has been supplied by Isen, Means, Patrick, and Nowicki (1982) who found that inducing positive affect serves as a retrieval cue for positive material in memory, which, in turn, may influence judgments.

Affect or mood has been shown experimentally to influence such "cold" cognitive processes as memory (e.g., Bower, Monteiro, & Gilligan, 1978; Ortony, Turner, & Antos, 1983) and learning (e.g., Gilligan & Bower, 1983). Along this line, Mayer and Bremer (1985) demonstrated that self-reported mood could influence performance on a variety of cognitive and psychomotor tasks. These "affect-sensitive tasks" included letter-cancellation,
letter search, and imagery.

Judgment formation has been a specific cognitive process that has been shown to be influenced by affect. In this regard, Schwarz, Strack, Kommer, and Wagner (1987) found that people tend to base evaluative judgments about their lives in general by referring to their present mood. Similarly, Schwarz and Clore (1983) found that mood provides an informational component in people's judgments about their general happiness and life satisfaction. These experimenters induced mood by having subjects vividly describe either a positive or negative recent event in their lives, or by interviewing subjects during either sunny or rainy days. Results showed that people induced into a good mood reported more general happiness and life satisfaction than people induced into bad moods. The positive impact of good mood on these broad judgments was found to persist even in the face of possible external explanations for the good mood, while the negative impact of bad mood was eliminated with such misattribution manipulations. The authors suggest that, during negative mood, people tend to be more motivated to account for their mood state by external explanations.

Forgas and Moylan (1987) interviewed movie patrons following film performances. They found in this field study that the responses of movie-goers who had just seen happy films were more positive and optimistic in topic areas such as political judgments, future expectations, and quality-of-life judgments than
those movie-goers who had seen films classified as either sad or aggressive in affective tone.

Mood has also been shown to influence other cognitive judgments. For example, Mayer and Volanth (1985) found that mood would influence the kind of advice that subjects would give. Mood state was also shown to affect associations to emotionally toned words, so that during pleasant moods, associations to pleasant words increased, while unpleasant mood states increased association and images to negative words. The finding that mood enhances the availability of mood-congruent material in memory seems to provide support for a spreading activation explanation (Bower & Cohen, 1982) for the interaction of mood and cognition.

An additional kind of cognitive judgment is self-evaluation. Salovey (1986) has supplied evidence that this process may also be greatly influenced by mood.

In short, the assertion that mood may have an important influence on cognitive performance and judgments seems established. The study carried out here concentrated on the ways in which mood may influence one specific kind of cognitive judgment—judgments of the probability of specific events.

Mood and Probability Judgments

Mayer (1986) discusses the ways in which mood may present a potentially powerful source of bias affecting risk judgments and other cognitive judgments of event probability. Mayer presents
the mood-biased judgment hypothesis. According to this hypothesis, good moods tend to yield more positive, optimistic judgments, and bad moods yield more negative judgments. Citing a relevant study by Pietromonico and Markus (1985), Mayer suggests that the more self-relevant the problem, the greater the impact of mood on judgments.

Evidence in support of the mood-biased judgment hypothesis comes in part from a series of experiments by Johnson and Tversky (1983). These investigators showed that induced mood could influence the estimates that subject gave for the probability of negative events. Mood was experimentally induced through the presentation of stories with tragic or adverse life themes. For example, one story described the death of a young man with leukemia. After reading the stories, subjects were asked to estimate the frequency of fatal events, such as homicide (experiments 1 and 2), or fatal events, nonfatal risks, and life problems (experiment 3). The results of these experiments suggested that the induction of negative affect increased subjects' estimates of life risks and undesirable events. This phenomenon occurred even when the subject of the story was unrelated to the risk that the subject was estimating, suggesting that it is not specific story content but the general effect of mood that influences judgment. In addition to these results, it was found that the induction of positive mood lowered estimated risk frequencies for negative events.
A study by Bower (1982) investigated how moods influence probability estimates of future events. Subjects were hypnotized into either a positive or negative mood. They were then given a questionnaire of possible future events, some of which were positive, some negative. Within each category, one half of the items were personal, and the others were related to world/national affairs. To counterbalance this procedure, subjects were then hypnotized into a mood opposite to that which they were first hypnotized and given another questionnaire in the same format as the first. The results of this study showed that mood affected subjects' probability judgments, so that happy moods increased estimates of future positive events and negative moods raised estimates of future negative events. Following Tversky and Kahneman (1973), Bower discusses an availability mechanism as a possible explanation of this finding. He suggests that mood makes mood-congruent memories more available, which then become the basis of probability estimates. The study by Johnson and Tversky (1983) noted above would seem to argue against this explanation, because risk estimates were not found to increase with greater similarity to the content of the mood-induction story. Johnson and Tversky suggest that this poses serious problems for memory-based explanations of the mood-biased judgment phenomenon.

While the studies cited above relied on the inducement of either positive or negative mood in their subjects, Mayer and Volanth (1985) studied the effects of naturally-occurring mood on
cognitive processes, including probability judgments. Subjects were asked to estimate probabilities for 10 pleasant (e.g., professional success) events and 10 unpleasant (e.g., illness) events. They found that positive mood was related to higher probability estimates for positive events, while negative mood had the same effect for probability estimates of negative events. Positive mood also was found to increase associations to pleasant words; negative mood did just the reverse. The authors explain their results in terms of the spreading activation theory of mood effects.

Clinical experience reinforces the idea that a relationship exists between mood and life judgments. Mania, for example, involves inflated estimates about the probability of positive events, such as becoming rich, powerful or famous. On the other hand, depression is known to involve negativistic, pessimistic judgments about the past, present and future. A well-known treatment approach alleviates depressed mood through the identification and challenging of negative, pessimistic thinking (Beck, Rush, Shaw & Emery, 1979). The mood-biased judgment hypothesis would add that as mood changes, from depression to a more positive mood, cognitive judgments would also be affected in a corresponding direction.

Thus, experimental research as well as clinical experience points to judgment effects caused by mood state. Recent research has helped to further illuminate mood-biased judgment effects, as
increasingly diverse variables have been shown to be relevant. One such class of variables are meta-mood experiences. Meta-mood experiences have been described as reflective experiences, as "products of a regulatory process that monitors, evaluates, and sometimes acts to change mood" (Mayer & Gaschke, 1988, p. 102). Examples of meta-mood factors include how out-of-control or under control direct mood is experienced, or how clear rather than confusing a particular mood seems (Mayer & Gaschke, 1988). With regard to the influence of mood on judgments, meta-mood experiences have been shown to contribute to predictions of mood-judgment interaction (Mayer, Mamberg & Volanth, 1988).

Consideration of mood-related traits has also been found to influence mood-judgment prediction. Neuroticism, for example, has been found to dampen the interaction of mood state and mood-related cognition such as judgment (Mayer & Volanth, 1985). To explain this phenomenon, the authors consider the concept of emotional integration and nonintegration. Emotional nonintegration has been found to have a positive correlation with neuroticism, as measured by Eysenck's (1973) Neuroticism/Extraversion scale (Mayer & Volanth, 1985). Mayer and Volanth argue, with reference to White (1956), that, quite possibly, neurotic individuals are less integrated in their affective and cognitive experiences. This would mean that neuroticism involves relatively greater independence of thinking and feeling. Greater independence of thinking and feeling would account for the
experimentally produced result that people with higher neuroticism scores show a lesser relationship between self-reported mood and mood-sensitive cognition than people with lower neuroticism scores.

The present experiment attempted to further illuminate the influence of affect of probability estimation. There were two particular goals for this research. The first was to employ a more subtle and more ecologically valid manipulation of mood than has been done in previous experiments on this topic. The induction of mood through the reading of stories (Johnson & Tversky, 1983) or hypnosis (Bower, 1982) may result in an emotional state with qualitatively different effects on cognition than the normal variation in mood experienced as a result of everyday events. Moreover, subjects may well be able to infer the hypothesis of the experimenters in these studies and choose to respond accordingly. For example, subjects who have been hypnotized into a negative mood may believe that they should make the probability judgments the way that they believe a depressed person would. In other words, induced mood in these previous studies may be influencing not the subjects' true beliefs about event probabilities, but rather the responses that they believe they should be making. Ideally, subjects should not realize that the mood induction procedure is at all related to the probability judgments that they are requested to make. This experiment employed a more ecologically valid and more subtle mood-induction
procedure by using the return of examination scores as a way of influencing subjects' moods.

The study was also concerned with the ways in which trait variables may influence the mood-biased judgment phenomenon. As discussed above, there is reason to believe that the trait of neuroticism may play a moderating role in this phenomenon (Mayer & Volanth, 1985). The experiment studied the impact of neuroticism and another trait variable, general optimism/pessimism. Since the mood-biased judgment phenomenon essentially deals with short-term fluctuations in optimism and pessimism, it is important to explore the ways in which the long-term trait of optimism and pessimism may play a role.
Method

Subjects

Subjects were male and female undergraduate Case Western Reserve University students enrolled in an introductory psychology class. Fifty-nine subjects were recruited, with participation voluntary for research participation credit.

Measures

Four measures were used in the experiment. The Brief Mood-Introspection Scale (BMIS) (Mayer & Gaschke, 1988) is a factor-based adjective scale that measures general mood (the BMIS is shown in Appendix A). For each of sixteen adjectives, a respondent is to indicate how well each one describes their present mood, from "definitely do not feel" to "definitely feel." Factor scores can then be obtained for each of four mood dimensions: 1) pleasant-unpleasant; 2) arousal-calm; 3) positive-tired; 4) negative-relaxed.

Mayer and Gaschke (1988) report good factorial validity for all scales of the BMIS. They also report reliability information for the four mood scales, with reliabilities being .83 for the pleasant-unpleasant scale, .58 for arousal-calm, .77 for positive-tired, and .76 for negative-relaxed. The BMIS has already been shown to be effective in predicting mood-influenced shifts in judgment (Mayer, Mamberg & Volanth, 1988). The present study focuses on the factor with greatest reliability, the pleasant-
unpleasant mood factor.

The second measure used is the Probability Estimation Scale, a subscale of the Affect-Sensitive Task Scale (as used in Mayer, et al., 1988). The Probability Estimation Scale is a theoretically derived scale consisting of 16 questions requiring the respondent to estimate the probability of 8 pleasant (e.g., economic improvement) and 8 unpleasant events (e.g., divorce). The degree of optimism in respondents' judgments can be determined by computing the difference between the estimated probabilities for potential occurrences and the probabilities for negative occurrences. Although Mayer (1991) reports that the reliabilities of the various subscales of the Affect-Sensitive Task Scale are typically low due to their brevity, the subscales have been found to correlate consistently with mood (Mayer, et al, 1988). (The Probability Estimation Scale appears in Appendix B.)

The Life Orientation Test (LOT) (Scheier & Carver, 1985) was used in Experiment 2 as a measure of dispositional optimism, defined by the authors in terms of the favorability of a person's outcome expectancies. The LOT, shown in Appendix C, consists of twelve statements (including four filler items) such as "I hardly ever expect things to go my way," and "I'm a believer in the idea that every cloud has a silver lining." Respondents are required to indicate their level of agreement or disagreement with each item, ranging from "strongly agree" to "strongly disagree."

In a discussion of their scale's psychometric properties,
Scheier and Carver (1985) report that the LOT appears unidimensional for most purposes. The LOT also shows acceptable internal consistency and a four-week test-retest reliability correlation of .79 suggesting reasonable stability over time. Studies done correlating the LOT with scales measuring constructs such as locus of control and hopelessness have resulted in adequate levels of convergent and discriminant validity (Scheier & Carver, 1985).

The final measure used was the Eysenck Neuroticism/ Extraversion Scale (short form) (Eysenck, 1973). This factor-based scale measures the traits of extraversion and neuroticism with the use of twelve yes-or-no questions. The six neuroticism questions include, "Are you sometimes bubbling over with energy and sometimes very sluggish?" and "Does your mind often wander while you are trying to concentrate?" Eysenck (1973) and Mayer, Mamber and Volanth (1988) accumulated experimentally derived data that supports the factor structure of the scale. Acceptable reliability was also found, with split-half reliabilities (corrected), being .79 for neuroticism. (Appendix D shows the Neuroticism/Extraversion Scale.)

Procedure

The Eysenck Scale and the LOT were administered to the students in the introductory psychology class approximately 3 weeks prior to the return by the course instructor of mid-term
examinations.

Mid-term exams were included as part of the study for several reasons—1) to provide a natural and ecologically valid method of mood induction; 2) to influence mood in a somewhat predictable direction (assuming that higher exam scores act as stimuli for positive mood, and lower scores for negative mood); and, 3) to increase the mood variance of the subject sample.

Before exams were returned, each subject was asked to predict what their exam score would be, in the possibility that it is not exam score per se, but rather the difference between obtained and expected score that is predictive of mood and judgment.

Following the return of the exams, half of the subjects were given the BMIS followed by the Probability Estimation Scale. The other half of the sample were given the measures in reverse order.

**Statistical Analysis**

Correlation analysis was done for all relevant combinations of variables. For example, a Pearson r was computed between mood score on the BMIS and performance on the Probability Estimation Scale to show whether probability judgments were related to mood state. Various partial correlations were also computed in order to determine direct relationships and to isolate mediating variables.
Results

Table 1 shows means and standard deviations for variables measured in this study, while Table 2 presents Pearson $r$ correlations among these variables. Statistical significance has been determined at the .05 level unless otherwise stated.

Insert Tables 1 and 2 about here

A primary focus of the experiment was on the issue of whether one's judgments about future events (as measured by probability estimates) would be related to a recent personal event. Looking first at correlations involving the probability estimation scale, a significant positive correlation ($r=.36$) was found between obtained scores on the mid-term examination and probability estimates. Higher obtained scores were related to more optimistic probability judgments. This suggests that experiencing a positive personal event (a relatively high exam score, for example) relates to a general increase in optimism about possible future events.

Mood score was also found to be significantly correlated with obtained test score ($r=.50$). Higher tests scores were related to more positive mood. This finding supports that which is commonly acknowledged: that the nature of recent personal experiences may relate to mood.
TABLE 1

Means and Standard Deviations for Seven Investigation Variables

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>n&lt;sup&gt;a&lt;/sup&gt;</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtained Score</td>
<td>59</td>
<td>46.14</td>
<td>8.74</td>
</tr>
<tr>
<td>Predicted Score</td>
<td>47</td>
<td>47.40</td>
<td>7.25</td>
</tr>
<tr>
<td>Difference Score</td>
<td>47</td>
<td>-.30</td>
<td>6.18</td>
</tr>
<tr>
<td>Mood</td>
<td>53</td>
<td>3.66</td>
<td>7.34</td>
</tr>
<tr>
<td>Optimism/Pessimism</td>
<td>47</td>
<td>5.43</td>
<td>4.79</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>49</td>
<td>1.39</td>
<td>3.66</td>
</tr>
<tr>
<td>Probability Estimation</td>
<td>53</td>
<td>91.68</td>
<td>153.03</td>
</tr>
</tbody>
</table>

<sup>a</sup>Numbers of subjects who completed measure for each variable.
**TABLE 2**

**Intercorrelations Between Investigation Variables**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtained</td>
<td>* .66</td>
<td>* .48</td>
<td>* .50</td>
<td>.12</td>
<td>* -.28</td>
<td>* .36</td>
</tr>
<tr>
<td></td>
<td>(47)</td>
<td>(47)</td>
<td>(53)</td>
<td>(47)</td>
<td>(49)</td>
<td>(53)</td>
</tr>
<tr>
<td>2. Predicted</td>
<td>—</td>
<td>* -.34</td>
<td>* .35</td>
<td>.21</td>
<td>-.19</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>(47)</td>
<td>(47)</td>
<td>(39)</td>
<td>(41)</td>
<td>(47)</td>
<td></td>
</tr>
<tr>
<td>3. Difference</td>
<td>—</td>
<td>.24</td>
<td>-.05</td>
<td>-.21</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(47)</td>
<td>(39)</td>
<td>(41)</td>
<td>(47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mood</td>
<td>—</td>
<td>* .45</td>
<td>* -.25</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(43)</td>
<td>(45)</td>
<td>(53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Opt/Pes</td>
<td>—</td>
<td>* -.32</td>
<td>* .29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(47)</td>
<td>(43)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Neuroticism</td>
<td>—</td>
<td>-.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(45)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Prob. Est.</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Numbers of subjects on which correlations are based shown in parentheses.  
*=p<.05.*
Taken together, the significant correlation between test score and probability estimates on one hand, and test score and mood on the other hand, support the effectiveness of test score as an experimental manipulation. Higher test scores lead to, or are at least related to, more optimistic probability estimates and more positive mood.

The significant correlation between obtained test score and probability judgments can be contrasted with the correlation \( r = 0.09 \) between mood and probability judgments, which did not reach statistical significance. Unlike the results found in previous studies, mood state was not found to influence judgment. Thus, data from this study did not support the mood-biased judgment hypothesis. Present findings suggest that probability judgments were, indeed, subject to influence, but not by mood. Judgments related to the degree of positiveness of a recent personal experience.

It can be seen, then, that midterm score related to both mood and probability judgments, but mood and judgments showed no significant correlation. Mood, therefore, does not appear to be a mediating variable in the relationship between test scores and judgments. Impacting events may influence subsequent judgments independently of mood.

Looking now at predicted, as opposed to obtained test scores, it can be seen that predicted scores correlated positively with mood scores \( r = 0.35 \), indicating that subjects in a more
positive mood made higher predictions. There was not a
significant correlation between predicted scores and probability
estimates. It appears that only scores that are actually
obtained, serving as stimuli along a positive to negative
continuum, are associated with probability judgments.

Note, also, that predicted exam scores were found to
correlate significantly ($r = .66$) with obtained scores, indicating
that, in general, subjects could predict with some accuracy how
well they had performed on the exam. (Note in Table 1 how the
similarity in means between obtained and predicted scores shows
subjects as a group accurately predicted their examination
scores.) Obtained scores correlated positively ($r = .48$) with
difference scores, a significant although trivial finding since
obtained scores entered into the computation of difference scores.
The significant negative correlation between predicted and
difference scores ($r = -.34$) is trivial for the same reason.

When correlations involving the trait-like variables of
neuroticism and optimism/pessimism are considered, a number of
correlations reach statistical significance. A significant
positive correlation ($r = .29$) was found between dispositional
optimism and probability estimates, showing that trait optimism
relates, in a predictable direction, with the degree of optimism
in judgments on a specific judgment task. The correlation between
optimism/pessimism and neuroticism ($r = -.32$) was also significant,
showing that trait optimism is inversely related to neuroticism.
Both trait variables were found to correlate significantly with mood state. Optimism/Pessimism correlated positively with mood state ($r = .45$). Neuroticism correlated negatively with mood state ($r = -.25$). Recall that both trait variables were measured approximately three weeks before test scores were revealed, with mood state measured almost immediately after test scores were revealed.

Partial correlations were computed with obtained exam scores partialed out to help explain the relationship between the trait measures and mood scores. The partial correlation of neuroticism and mood, with obtained score partialed out, becomes statistically non-significant. Since the correlation between neuroticism and exam scores is significant and negative ($r = -.28$), the result of the partial correlation analysis showing no direct relationship between neuroticism and mood becomes understandable (less neurotic people did better on the exam, and exam score relates positively to mood). The partial correlation between mood and optimism/pessimism with obtained score partialed out is virtually unchanged, showing that there is a real relationship between mood and degree of optimism, which is not dependent on performance on the exam.

One final partial correlation was computed, between predicted exam score and mood score, with obtained score partialed out. The partial correlation is not significant. This means that the relationship between mood and predicted scores ($r = .35$)
depended on obtained score. People who predicted higher scores tended to do better on the exam and were thus in a better mood after exams were returned. However, there is no direct relationship between predicted score and mood after exams were returned.

Finally, when the subject sample is divided into 2 groups using a median split based on neuroticism score, no significant difference is found between groups for the relationship of mood and probability judgment. This result is in contrast with Mayer and Volanth's (1985) proposition that neurotic individuals, being less psychologically integrated, would show a lesser relationship in such psychic processes as affect and judgment than non-neurotics. The present study found that neuroticism did not influence mood-judgment interaction.
Discussion

The purpose of this study was to investigate how emotions affect the particular cognitive task of probability estimation. Participants were undergraduate college students. Examined were the effects of a naturally-occurring life event, the return of graded mid-term examinations. Obtained exam score was intended to serve as a mood-influencing event with far greater ecological validity than the methods (hypnotism, story-reading) used in previous laboratory studies of the effects of mood on probability judgment. Both mood and probability estimation were measured following the return of the exams. The results showed that the exam was related to subjects' responses on other measures. Obtained score was found to be significantly positively correlated with both mood and probability estimation.

This result replicates findings from studies with more artificial methods of mood induction (e.g., Bower, 1982; Johnson & Tversky, 1983) that found probability judgments to be affected following a mood-induction procedure. The results, however, failed to provide support for the direct impact of mood on probability estimates. Mood and estimates showed no significant relationship.

Rather, judgments seemed to be related to the valence, positive or negative, of the personally relevant event preceding the estimation, in this case, the return of mid-term exams. Obtained test score was found to be significantly positively
correlated with probability estimation. Thus, it was found rather unexpectedly that the procedure designed to influence mood was related to probability judgments directly, too, without mood as the intervening variable.

These results vary from expectations based on Mayer's (1986) mood-biased judgment hypothesis. Recall that the mood-biased judgment hypothesis suggests that good moods yield more optimistic judgments, while bad moods yield more pessimistic judgments. The suggestion is that moods affect judgments directly. The series of experiments by Johnson and Tversky (1983) lent further support to the influence of mood on judgments when it was found that participants who had read stories with tragic themes had increased estimates of life risks. Johnson and Tversky assumed that the stories influenced a subject's mood and that these mood changes influenced probability estimates. However, the present study found no direct relationship between mood and judgment.

In effect, this study supports a dual-effect theory of life events. First, it suggests that mood is indeed subject to influence, specifically by the nature of life events. This is consistent with what most people intuitively recognize. Second, the study suggests that probability judgments are subject to influence, not directly through mood, but also by the nature of life events. The more natural, and presumably more subtle mood-induction procedure employed in this study seemed to help isolate the direct relationship of life events to judgment, without mood
as the hypothesized necessary link. Subjects were less likely to comply with what they perceived to be experimenter wishes, as might happen with a more obvious mood induction procedure (e.g., mood induction through hypnosis or through the reading of stories with tragic themes where subjects might perceive that they are also to be pessimistic in judgment).

One might hypothesize, then, that it is the nature of what happens to people in the past that serves to influence their judgments of what will happen in the future. The present study shows that this influence may occur without mood as the mediating variable or link. Perhaps the effect is strictly cognitive. In other words, the occurrence of a positively or negatively valenced event exerts a generalized influence on the degree of optimism in probability judgments of possible future events. People may consider, for instance, that positive events are likely because of the recent experience of a positive event.

The recent event may exert its influence through an availability mechanism as Tversky and Kahneman have illustrated (1973). Thus, for example, in the present study, the receipt of a relatively good exam grade may have served as an available instance in memory of a positive event. One may tend to be more optimistic about other, very different, positive events because an experience with one specific positive event is particularly available to one's mind.

The question arises about the reason that other studies have
found that mood affects probability judgments. As has been discussed, in studies where the mood induction procedure was obvious (e.g., Bower's, 1982, induction of mood through hypnosis), subjects may have responded to subsequent questionnaires in ways that they felt that they should. The present findings also raise questions about the conclusions of other studies that hypothesized mood to be the mediating variable between intervention and probability estimation after the fact. Recall that in the Johnson and Tversky study (1983) the authors explained the influence on probability judgments of stories with tragic themes by a mood mechanism. Mood was thought to be the intervening variable because the subject of the presentation story could influence judgment without similarity in content to the estimation item. The present study suggests that this may occur without mood as the necessary explanation. There may be a generalized effect of experience with, or knowledge of, an event of a certain positive of negative valence so that the event influences the nature of probability judgments of events similar in valence but different in theme from the experienced event. Thus, for example, a recent promotion at work might influence the positiveness of one's judgment about the likelihood of a successful marriage because there is a similarly valenced event available as an example of positiveness of outcome.

In a semantic network model, one can imagine spreading activation from the concept of Good Midterm Test Score to other
concepts such as Good Course Grade and Positive Future. This can affect estimates about the likelihood of future events. The process occurs without necessary activation of mood as an intervening link, although a mood may be energized as activation spreads. Thus, in the present study, one might suppose that activation spread from exam score to prime certain concepts that impacted on probability judgment, and that, although a corresponding mood was also activated by exam score, mood did not appear to be an essential link between score and judgments.

In terms of a semantic network model, one would expect that stable, generalized expectancies are represented in the network structure and connections. In fact, the present study indicates that trait variables are relevant in understanding probability estimation. For example, estimates are related to dispositional optimism or pessimism, in addition to the influence of specific valenced events. The significant correlation between probability judgments and dispositional optimism measured three weeks earlier suggests that probability judgments relate to generalized outcome expectancies. Mood is also related to dispositional optimism, again measured three weeks earlier than mood, illustrating how "states" can be related to "traits." Thus, here, as in other situations, particular cognitions and affects seem related to both stable trait-like factors as well as to the impact of relevant recent occurrences.

Mayer and Volanth's (1985) hypothesis about the trait
variable of neuroticism is largely unsupported in this investigation. Although neuroticism, as measured by the Eysenck Scale, correlated negatively with another trait variable, optimism/pessimism, it was not found to influence the interaction of mood and judgment, as Mayer and Volanth predicted. Neuroticism also did not correlate with mood, when obtained score was partialed out.

With regard to personality functioning and clinical application, the present findings suggest that there is not a necessarily direct relationship between mood and expectations about life. Mood and judgments are at least partly independent, though they may be influenced in similar ways by a particular event. A variable might conceivably influence mood without affecting expectations about life, and vice versa. It follows, for example, that if one is interested in changing people's beliefs about the future, it might more effectively be done directly, rather than indirectly through mood. Zajonc's (1980) description of the partial independence of affect and cognition seems to gain some support by the findings of the present study.

It would seem useful in clinical work to recognize and put to therapeutic advantage what can be a direct relationship between life events with mood and judgments about the future. Therapists, counselors and other mental health practitioners may enhance the likelihood for clients of achieving positive, successful life outcomes when they occur infrequently. Cognitive/Behavioral
therapists often use skill training and anxiety-reducing techniques to bolster the likelihood that clients will experience positive outcomes, while dynamically-oriented therapists help illuminate maladaptive, self-defeating, yet unconscious, processes that hinder a client's chance for success in social and occupational areas. However done, therapy may also be helpful in channeling success into positive mood and judgment when barriers in this channel exist. Attribution techniques, for example, encourage clients to examine and counter tendencies to attribute success to strictly environmental factors and failure to purely personal ones. The therapeutic focus extends beyond affecting mood through cognition, as emphasized in Beck et al. (1979), to helping increase the likelihood of positive outcomes in life, and removing obstacles to the channeling of success into positive mood and outlook.

As with any single experiment, questions are raised that require further study. One may ask whether a causal relationship existed between exam score and responses on mood and probability estimation measures. A direct causal relationship between exam score and either mood or probability estimation was not established, only suggested, and thus awaits further study. Also, the importance of exam score was not measured for individual subjects or the subject sample as a whole, and may be a significant variable in the relationship of exam score with mood and judgment.
Overall, this study shows how traits, states, recent events and cognitive processes may interact with and influence one another. The relationships are complex, being either directly interactive, or being mediated by third variables. Possibly, with other state, trait and cognitive variables, such as attributional tendencies, various alternative interaction patterns would occur. Further research is needed to help make these complex and sometimes subtle relationships increasingly understandable.


## Appendix A

**Brief Mood-Introspection Scale**

**Directions:** Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood. Do not leave any items blank.

<table>
<thead>
<tr>
<th>Definitely don't feel</th>
<th>Don't feel</th>
<th>Slightly feel</th>
<th>Definitely feel</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX</td>
<td>X</td>
<td>V</td>
<td>VV</td>
</tr>
</tbody>
</table>

| Lively                | XX         | X             | V               | VV          |
|-----------------------|------------|---------------|-----------------|
| Drowsy                | XX         | X             | V               | VV          |
| Happy                 | XX         | X             | V               | VV          |
| Grouchy               | XX         | X             | V               | VV          |
| Sad                   | XX         | X             | V               | VV          |
| Peppy                 | XX         | X             | V               | VV          |
| Tired                 | XX         | X             | V               | VV          |
| Nervous               | XX         | X             | V               | VV          |
| Caring                | XX         | X             | V               | VV          |
| Calm                  | XX         | X             | V               | VV          |
| Content               | XX         | X             | V               | VV          |
| Active                | XX         | X             | V               | VV          |
| Gloomy                | XX         | X             | V               | VV          |
| Fed up                | XX         | X             | V               | VV          |
| Jittery               | XX         | X             | V               | VV          |

Active | XX | X | V | VV |
Appendix B

Probability Estimation

INSTRUCTIONS: The following questions ask you to judge the likelihood of a series of events. For each question, make the best estimate you can of how frequent the event or occurrence is. Report all estimates in percentages.

EXAMPLE: 50% What is the probability of tossing a penny and having it land head-side up?

1.____ What is the probability that eating a good diet will increase a person’s lifespan more than a year?

2.____ What is the probability of the average marriage ending in divorce?

3.____ What is the probability that the public schools will be better 10 years from now that they are today?

4.____ What is the probability of war erupting anywhere in the world in a given month?

5.____ What is the probability of a marriage resulting in long-term happiness for both members of the couple?

6.____ What is the probability of a fifty-year-old man contracting heart disease.

7.____ What is the probability that exercise will increase a person’s lifespan more than one year?

8.____ What is the probability of the average fifty-year-old woman contracting cancer?
9. ____ What is the probability of the economy improving in the next three years.

10. ____ What is the probability of there being fewer good job opportunities in the future than there are now?

11. ____ What is the probability that there will be an atomic war in the next five years?

12. ____ What is the probability that the average person will be a victim of crime this year?

13. ____ What is the probability of having beautiful weather or a two-week long vacation?

14. ____ What is the probability of a baby being born in this country in poor health?

15. ____ What is the probability of at least one of the friendships of an 18-year-old lasting for the rest of that person's life?

16. ____ What is the probability that a 30-year-old will be involved in a happy, loving romance?
Appendix C

Life Orientation Test

Directions: For each item below, indicate the extent of your agreement from 4=strongly agree to 0=strongly disagree. Try not to let your answers to one question influence your answers to other questions. Remember, there are no correct or incorrect answers, so try to be as accurate and as honest as you can.

4=strongly agree, 3=agree, 2=neutral, 1=disagree, 0=strongly disagree

1. In uncertain times, I usually expect the best. 4 3 2 1 0
2. It's easy for me to relax. 4 3 2 1 0
3. If something can go wrong for me, it will. 4 3 2 1 0
4. I always look on the bright side of things. 4 3 2 1 0
5. I'm always optimistic about my future. 4 3 2 1 0
6. It's important for me to keep busy. 4 3 2 1 0
7. I enjoy my friends a lot. 4 3 2 1 0
8. I hardly ever expect thing to go my way. 4 3 2 1 0
9. Things never work out the way I want them to. 4 3 2 1 0
10. I don't get upset too easily. 4 3 2 1 0
11. I believe the idea that every cloud has a silver lining. 4 3 2 1 0
12. I rarely count on good thing happening to me. 4 3 2 1 0
Appendix D

**Neuroticism/Extraversion Scale**

**Directions:** Answer YES or NO for each item below. Answer all items without leaving any items blank. Remember, there are no correct or incorrect answers, so try to be as accurate and honest as you can.

<table>
<thead>
<tr>
<th>Item</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you sometimes feel happy, sometimes depressed, without any apparent reason?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>2. Do you prefer action to planning for action?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>3. Do you have frequent ups and downs in mood, either with or without apparent cause?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>4. Are you happiest when you get involved in some project that calls for rapid action?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>5. Are you inclined to be moody?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>6. Does your mind often wander while you are trying to concentrate?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>7. Do you usually take the initiative in making new friends?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>8. Are you inclined to be quick and sure in your actions?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>9. Are you frequently &quot;lost in thought&quot; even when supposed to be taking part in conversation?</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>
10. Would you rate yourself as a
   lively individual? Y N
11. Are you sometimes bubbling over with energy
    and sometimes very sluggish? Y N
12. Would you be very unhappy if you were
    prevented from making numerous social contacts? Y N