Mood and Performance: A Model Incorporating Self-Efficacy and Attributions

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MOOD AND PERFORMANCE: A MODEL INCORPORATING SELF-EFFICACY AND ATTRIBUTIONS

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(ABSTRACT)

The construct of mood (defined as a transient feeling state) has been shown in numerous studies to have a great effect on our daily lives. The purpose of the present study was twofold: (1) to investigate the effects of mood on psychomotor test performance, and (2) to examine the conceptualization of mood more closely. An experiment was conducted investigating the effects of positive (happy, elated) and negative (sad, depressed) mood on a newly developed Air Force selection battery. In addition, self-efficacy, perceived performance, and causal attributions were measured as potential contributors to the mood-performance relationship. Subjects consisted of Air Force Recruits at Lackland Air Force Base. Mood was manipulated by showing emotionally laden film clips before administering the test battery. The selection battery consisted of psychomotor tests, which measure reaction time and hand-eye coordination.

The mood and performance model was tested through the structural equation modeling technique, LISREL. Results indicated that mood did not
have an effect on any of the variables in the model. However, this null result was likely due to a relatively weak mood induction. Self-efficacy was found to predict both performance and perceived performance, and performance was found to predict perceived performance. Post-hoc analyses revealed that performance predicted mood such that subjects who performed well were in a better mood than subjects who performed poorly. What is still in question is whether mood, in turn, influences performance.

The conceptualization of mood was examined by addressing the counter-intuitive theory by Watson, Clark, and Tellegen (1988) that positive and negative mood are two independent factors. This theory was examined by comparing factor structures from two different mood scales. On a more traditional scale in which only extremely worded mood items are included, positive and negative mood factors were not found to correlate. However, on a newly constructed mood scale entitled the Composite Mood Checklist (CMC), the mood factors were found to significantly correlate in a negative direction. This finding lends evidence to Spector et al.’s (1995) argument that positive and negative mood independence is an illusion created by artifactual mood scales.
Dedicated to my lovely wife, Heather
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INTRODUCTION

Ask any employer what their number one concern or goal is, and most would answer, "Hiring individuals who are going to perform successfully on the job." This goal, however, can prove to be an elusive one. For decades, Industrial/Organizational Psychologists have researched potential predictors of performance. From the inane (e.g., graphology) to the naive (e.g., letters of reference, interviews) to the controversial (cognitive ability tests), researchers have recommended many different methods of selection. Meta-analyses (Hunter & Hunter, 1984; Ree & Earles, 1992) have indicated that cognitive ability tends to be the most valid and ubiquitous predictor of job performance. It is well known, however, that cognitive ability is hardly a perfect predictor of performance. Its median validity coefficient is about .25, leaving roughly 94 percent of the variance unexplained (Chiselli, 1973; Schmitt, Gooding, Noe, & Kirsch, 1984).

There are a number of potential reasons for this shortcoming. One obvious reason is that cognitive ability is not related to all aspects of a job, and therefore, should not be expected to predict job performance perfectly. Therefore, other predictors need to be considered in addition to cognitive ability. With the advent of the Big Five theory, personality tests have become a popular addition to selection batteries. Meta-analyses (Barrick & Mount, 1991; Tett, Jackson, & Rothstein, 1991) have indicated that it can add incremental validity over cognitive ability.

It still remains, however, that selection batteries with multiple predictors fail to account for most of the variance, leaving a substantial amount of unexplained error variance. Researchers such as Murphy (1989) and Henry and Hulin (1987) have argued that some of this remaining error
variance is due to the fact that job performance is a dynamic criterion. That is, employees' abilities change over time and, consequently, static predictors such as cognitive ability or personality diminish in validity. This argument aside, however, it is also true that these tests are not perfectly reliable. There are no doubt numerous reasons for test unreliability, and one possibility that has not been given enough attention is the test-taker's mood. Intuitively, one would expect that an individual who is feeling upset or depressed will score worse on an ability test than someone who is feeling happy or enthusiastic. Certainly, the literature has shown that test anxiety can greatly interfere with test performance (see Head & Lindsey, 1983 for a review). However, the relationship between mood and test performance has not been examined as thoroughly.

The purpose of the present study is to examine in more detail the relationship between mood and performance. This relationship has been studied across a number of domains, but there has been two shortcomings in this line of research. The typical procedure has been to induce subjects into a particular mood and then measure their subsequent performance on a task lasting maybe ten minutes. In a typical job, however, most tasks last much longer than ten minutes. Thus, it is important to establish whether mood has a continual influence on a task. In the present study, mood will be examined on a series of tasks that last a significant period of time (about an hour).

A second shortcoming is that researchers have failed to establish a model of the mood-performance relationship. Variables such as self-efficacy and attributions have been found to relate to both mood and performance, but no one has fit these constructs together in a nomological network and
tested it. In the present study, a mood-performance model (see Figure 1) will be asserted and tested within an experimental design.

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Insert Figure 1 about here

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In order to thoroughly address the rationale behind this model, relevant literature will be reviewed. A general overview of mood will be given, along with a discussion of the various methods of manipulating mood. Reviewing the induction techniques is important, because some techniques are less effective than others, and may be confounded with relevant predictors of performance. Literature concerning each piece of the model will also be reviewed. Specifically, the relationships between mood and performance, mood and self-efficacy, and mood and attributions will be addressed.

**Mood**

Although a commonly used term, the definition of mood is often blurred with the construct emotion. Morris (1989) asserts two major differences between mood and emotion: (1) mood is capable of altering responses to a wide variety of objects and events, whereas emotion instigates a relatively limited set of responses, and (2) mood is typically less intense than emotion.

Mood can also be distinguished from affectivity. Whereas mood represents a state and is transient, affectivity is defined as a trait and is stable. Affectivity is viewed as a predisposition to moods (Tellegen, 1982; Watson & Clark, 1984). Indeed, correlations between affective states (moods) and
affective traits (affectivity) are quite high: .47 for positive state-trait comparisons and .52 for negative state-trait comparisons (Tellegen, 1982). Oppositely valenced comparisons (e.g., positive mood/negative temperament), however, do not correlate. This finding lends support to both Tellegen’s and Watson and Clark’s theories that positive affect and negative affect (whether measured as a state or a trait) represent two independent dimensions. Watson and Clark clarify the separability of positive and negative affect by describing high and low dimensions for both. They define positive affect as a dimension reflecting the extent to which a person is feeling a zest for life, “up versus down.” Words such as active, excited, alert, enthusiastic, and strong define high positive affect, whereas words such as sluggish and drowsy (reflecting fatigue) best characterize low positive affect. Negative affect, on the other hand, represents the extent to which a person feels upset or unpleasantly aroused (anxious). High negative affect is best characterized by words such as, distressed, upset, nervous, guilty, and scornful (reflecting a negative self view). Low negative affect is characterized by words such as calm or relaxed.

There is some controversy, however, about whether mood consists of two independent dimensions of positive and negative affect or lies on a single, bipolar dimension. Spector, Van Katwyk, Brannick, and Chen (1995) argue the latter, stating that the often cited result that mood lies on two separate dimensions is an artifact produced by the scales on which they are measured. They point out that these scales typically consist of two sets of extreme items that are worded in opposite directions. This type of scale construction is conducive to what has been called the ideal point or the unfolding principle, which implies that there is a curvilinear rather than
linear relation between the extent of agreement with an item and an individual’s standing on mood. That is, given a particular item, people whose standing is either higher or lower than the item will be likely to disagree with it. Thus, on a scale in which only extremely worded items are included, respondents who are slightly positive, slightly negative, or neutral may disagree with both sets of items. This lack of consistency across item type will attenuate the correlations between the two types of items, thereby producing seemingly independent positive and negative mood factors.

It should also be noted that negative mood can be characterized in many different ways. McConville and Cooper (1992) conducted a factor analysis on 170 mood items taken from numerous widely used questionnaires. They found that negative mood consisted of three factors: depression, hostility, and anxiety. Bodenhausen, Sheppard, and Kramer (1994), however, point out that negative mood has been treated as a global construct, which is an oversimplified approach. In agreement with McConville and Cooper, Bodenhausen et al. state that negative mood consists of discrete emotions such as anger, sadness, and anxiety that do not necessarily affect behavior in the same way. In the present study, negative mood is conceptually defined as depression or sadness.

The relationship between mood and social behavior has been studied extensively over the past twenty years. Positive moods have been found to be associated with an increase in helping behavior (George, 1991), more willingness to initiate conversations with others (Isen, 1984), the expression of greater liking for others (Isen, 1984), favorable evaluations of others (Sinclair, 1988), greater likelihood of taking risks (Isen, Means, Patrick, & Nowicki, 1982), and faster speech (Isen, 1984) to name but a few.
The influence of negative mood on social behavior is also substantial, though not as consistent. Negative feeling states sometimes result in reduced helping or increased aggression, but can also result in increased helping and, at other times, can have no effect at all (Isen, 1984). Individuals in a negative mood also exhibit a decreased attraction for others (Isen, 1984), provide more realistic evaluations of others (Sinclair, 1988), and interpret ambiguous stimuli negatively (Isen & Shalker, 1982). Clearly, mood can have a great effect on our daily lives.

The Induction of Mood

Researchers have used numerous techniques to experimentally manipulate moods. Commonly used techniques include the Velten technique, facial (or postural) posing, false feedback, film, free gifts, imagery, music, suggestion, and hypnosis. All of these techniques have been shown to be effective in inducing the targeted mood states. At the same time, these techniques tend to produce moods that last no longer than ten minutes, unless they are periodically bolstered through readministration (Clark, 1983; Isen & Gorgoglione, 1983). Recall that one purpose of the present study is to examine the effects of mood on performance over a longer period of time. Therefore, it is important to use mood induction techniques that can be continually or periodically readministered. The Velten, music, false feedback, and film techniques are best geared towards this readministration. They will be reviewed below, and it will be explained why only the film technique will be used in the present study.

Perhaps the most widely used method of mood induction has been the Velten procedure (Velten, 1968). It has been used to manipulate elated, neutral, and depressed moods. The procedure involves a series of
emotionally laden, self-referent statements read aloud by subjects. Subjects are typically instructed to try and feel the mood described by the statements. Elated statements connote competence and self-worth (e.g., “My judgment about most things is sound”), and somatic energy and well-being (e.g., “I feel cheerful and lively”). Depressed statements convey a sense of worthlessness and hopelessness (e.g., “Perhaps college takes more time, effort, and money than it’s worth”) and somatic lethargy and ill health (e.g., “I’m getting tired out. I can feel my body getting exhausted and heavy”), Neutral statements are void of any emotion (e.g., “Oklahoma City is the largest city in the world, in area, with 631.166 square miles”).

Despite its widespread use, the Velten procedure is not without its problems. In Clark’s (1983) literature review, he found that the Velten procedure failed to induce a mood for a substantial number of subjects. For example, Polivy and Doyle (1986) reported that only 50% of their subjects reported actually feeling the targeted mood immediately after the induction. In addition, Sirota and Schwartz (1982) found that only 70% of their subjects in a repeated measures design met a mood change criterion of .5 points. Teasdale and Taylor (1981) reported an even smaller percentage (54%) who met their mood change criterion of 20 points out of 100. As Clark (1983) points out, in a design requiring 20 subjects in a depressed mood and 20 subjects in an elated mood, it might take 80 subjects to complete the design when using the Velten procedure. This problem prompted the author not to use this technique for inducing mood.

Another technique is the music induction procedure. This technique typically requires subjects to listen to a mood-suggestive piece of classical or modern music. In Clark’s (1983) same review, he found studies which
indicated that the music induction procedure produced the desired mood in 87% of subjects. In addition, in a direct comparison between the Velten and music procedures, the latter was found to have a greater effect on despondency and happiness. In these studies, Clark points out that the music procedure included explicit instructions to use the music to get into the targeted mood, which prompted Clark to state that music inductions would probably not work without these explicit instructions. Kenealy (1988), however, found that explicit instructions were not necessary. She conducted an elaborate study, in which positive, negative, and neutral moods were manipulated through music with instructions and music without instructions. In addition, two counter-demand characteristic groups were analyzed, where subjects were told that the music would have an opposite effect on their mood (i.e., happy music would lead to depressed mood and sad music would lead to an elated mood). She found that the music only and music plus instructions groups both produced the desired moods (measured through self-report and behaviorally), and the counter-demand groups did not produce the opposite mood. Thus, it appears that explicit instructions are not necessary for successful mood induction, and music effects are not due to demand characteristics. As further evidence for the effectiveness of the music procedure, Gerrards-Hesse, Spies, and Hesse (1994) found in their review that music procedures were successful (i.e., produced significant differences on self-reports between positive and negative mood groups) in 21 out of 22 studies.

Unfortunately, music has the potential of distracting subjects, especially when they are asked to perform cognitive tasks as in the present study. The problem with distraction is twofold. First, it runs the risk of actually
frustrating and annoying subjects in the positive mood condition, thereby producing the opposite mood state than intended. Second, any detrimental effects on performance might be misattributed to mood instead of distraction. In light of these problems, the music technique will also not be used as the mood induction in the present study.

Another often-used technique for inducing mood involves providing false performance feedback to subjects. Typically, subjects are asked to complete a bogus cognitive ability test, and then are either given false-positive or false-negative feedback concerning their performance. This technique has also been shown to be effective. In Gerrards-Hesse et al.'s (1994) review, they found the false feedback technique to be effective in 9 out of 11 studies when making comparisons between positive and negative mood groups.

Despite its effectiveness, the false feedback procedure is problematic for the present study. When examining the relationship between mood and performance, the problem with using false feedback is that in addition to manipulating mood it manipulates self-efficacy (Hill & Ward, 1989). Therefore, any explanations for performance effects are potentially biased in that it is unknown whether performance is caused by mood, self-efficacy, or both. In order to avoid this confusion, the false feedback technique will also not be used in the present study.

One technique that does not appear to be problematic for the present study is the film or movie procedure. This technique typically entails subjects watching a film lasting anywhere from 10 to 30 minutes before engaging in the experimental tasks of interest. Positive mood films are usually comedies or bloopers, and negative mood films often concern death or illness (Forgas,
1990; Kraiger, Billings, & Isen. 1989; Murray, Sujan, Hirt, & Sujan, 1990; Saavedra & Earley, 1991; Tomarken, Davidson, & Henriches, 1990; Townsend, Kek, & Tuck, 1989). In both cases, films seem to be quite effective in producing the desired mood state. In their review, Gerrards-Hesse et al. (1994) found the film technique to be effective in al 14 studies reviewed when making comparisons between positive and negative mood groups. Other studies not included in Gerrards-Hesse et al.'s review also found the film technique to be effective. For example, Tomarken et al. (1990) found differences between those watching positive films and those watching negative films both in terms of subjective ratings and in terms of frontal lobe activation (i.e., negative film clips produced more right frontal lobe activation than positive film clips).

Mood and Performance

Relatively few studies have investigated the effects of mood on performance, of which most have focused on creativity or problem solving. The general finding has been that positive mood facilitates problem solving. For example, Isen, Daubman, and Nowicki (1987) found that positive mood facilitated performance on two different problem solving tasks. On one task, called Dunker's candle task, subjects were given a book of matches, a box of tacks, and a candle, and were required to affix the candle to corkboard in such a way that it did not drip wax on the floor (the correct solution is to empty the box of tacks, tack the box to the wall, and use it as a platform for the upright candle). Isen et al. found that subjects in a positive mood arrived at the correct solution more often than subjects in a neutral mood. The authors explained this result through the associative network theory (Bower, 1980). More specifically, positive mood cues and facilitates access to positive
material in memory. Positive material is more extensive and diverse than other material. Therefore, a person in a good mood has access to a larger and more diverse set of cognitive material.

The authors point out, however, that the high number of solutions in the positive mood condition may have simply been due to high levels of arousal resulting from the mood induction. In order to test this competing hypothesis, Isen et al. conducted a second experiment, in which they included a positive and a negative mood condition, along with an arousal condition (two minute participation in a step exercise). In support of their theory, they found that positive mood resulted in more solutions than the negative mood condition, the neutral mood condition, the no mood condition and, most importantly, the arousal condition. Interestingly, they found that negative mood did not hinder performance, as subjects in the negative mood condition arrived at essentially the same number of solutions as subjects in the neutral mood condition.

In an effort to generalize these results, Isen et al. conducted two more experiments in which they used a different problem solving task. Entitled the Remote Associates Test, subjects were shown three words and were required to provide a word that related to the set of three words. For example, subjects might be given the words “mower, atomic, foreign,” requiring them to provide the word “power.” In experiment 3, the authors found that subjects in a positive mood provided more correct responses than subjects in a neutral mood on the moderately difficult items only. In experiment 4, they found that subjects in a positive mood provided more correct responses than subjects in a no mood manipulation condition and subjects in an arousal
condition. Thus, it appears that positive mood facilitates problem solving by activating a more extensive library of task relevant material.

Other studies have corroborated these results. Kavanagh (1987) found that subjects in a positive mood persisted longer at and solved more anagrams than subjects in a negative mood. Greene and Noice (1988) found that children in a positive mood were able to generate more words and solve the candle task more often than children in a neutral mood. Greene and Noice also explained this result through the associative network model, stating that there is a tendency for persons in a good mood to relate and integrate divergent material, to form new associations, and to recombine mental elements. Nicholas and Weiss (1994) also found that subjects in a positive mood solved the candle task at a higher rate than subjects in a negative mood. Interestingly, positive mood did not lead to better performance on the Tower of Hanoi puzzle, which represented a more analytical as opposed to creative problem solving task.

Studies on other cognitive variables have failed to find any mood effects. Tucker, Stenslie, Roth, and Shearer (1981) looked at mood's effect on arithmetic performance and found no differences between the positive and negative mood conditions. The arithmetic task may have been too easy, which could have prevented subjects in a positive mood from performing higher than subjects in a negative mood (i.e., ceiling effect). The authors did find that subjects in a negative mood condition showed decrements in vividness of imagery (for this task, subjects imagined an item like a clock, and then rated how vivid that image was to them). Allwood and Bjorhag (1991) examined performance on general knowledge questions (e.g., nature, society, geography, literature), and did not find any mood differences. This null
result, however, may have been due to a weak manipulation of mood, as their manipulation check indicated that they failed to induce a positive mood and induced only a slight negative mood.

In summary, the studies measuring creativity or problem solving ability appear to have been the soundest studies addressing mood. Their conclusions indicate that positive mood leads to better performance than either neutral or negative moods. Negative mood does not appear to lead to worse performance than neutral mood.

**Self-efficacy and Performance**

Self-efficacy can be defined as one's own perceived ability on a specific task, activity, or domain (Bandura, 1982). In general, judgments of self-efficacy predict specific performances accurately (Bandura & Cervone, 1983). In fact, self-efficacy judgments have been found to predict performance even more closely than past performance on the task (Bandura & Schunk, 1981). Bandura (1982) reasons that self-efficacy judgments achieve their significance because people who have high self-efficacy for a certain activity are more likely to enter situations where the activity may occur and they will attempt more difficult variations of the task. They also tend to persist at tasks for longer periods of time and expend more effort (Bandura & Schunk, 1981). Clearly, there is an established relationship between self-efficacy and performance. Therefore, any effects of mood on self-efficacy are likely to have an effect on performance.

**Mood and Self-Efficacy**

Research has indicated that individuals in a positive mood generally report higher levels of self-efficacy than individuals in a negative mood. Kavanagh and Bower (1985) hypnotized subjects into positive, neutral, and
negative moods and then had them report levels of self-efficacy across a wide range of domains such as romantic, interpersonal, and athletic. They found that happy mood led to the highest overall efficacy score and sad mood led to the lowest score, with neutral mood falling in between. Saavedra and Earley (1991) found that mood (induced by showing films) affected subjects' self-efficacy for evaluating employees. Positive mood led to higher self-efficacy and negative mood led to lower self-efficacy. In addition, Saavedra and Earley found that subjects in a negative mood performed worse than subjects in a positive mood, and either changed tasks (to an easier one) or changed their goals (to a lower one). Subjects in a positive mood kept working on the same task with the same goal.

Mood has also been found to have an effect in the physical performance domain. Kavanagh and Hausfeld (1986) found that subjects in a positive mood reported higher levels of self-efficacy for push-ups by indicating that they could perform more push-ups (m = 15.1) than subjects in a negative mood (m = 12.5). Unfortunately, the authors did not proceed to measure actual pushup performance to see if self-efficacy went on to predict performance. In their second experiment using a different task, however, Kavanagh and Hausfeld did measure performance. They found that subjects in a positive mood outperformed subjects in a negative mood on a handgrip task, where subjects were required to squeeze a dynamometer as hard as they could. They did not, however, find differences in handgrip self-efficacy. They reasoned that, because subjects were not familiar with this task, they did not have any basis for making a self-efficacy judgment. Consequently, any mood effects on the self-efficacy judgment did not have a chance to emerge. Recall, however, that Isen and Shalker (1982) found that mood effects were most
pronounced when rating ambiguous stimuli as opposed to more familiar stimuli. A more likely reason for this result is that subjects viewed the task as independent from effort. That is, they may have erroneously felt that no matter how hard they tried, their grip strength would remain the same.

Mood effects are much less likely to change an opinion in this situation, than in a situation where subjects perceive that more or less effort can affect their level of performance. In the case of the pushup task, subjects probably believed that more effort would lead to more pushups, which allowed for mood effects on self-efficacy to emerge.

There is some evidence that self-efficacy may actually serve as a mediator between mood and performance. Quade and Williams (1994) conducted a repeated measures design, with mood and self-efficacy as measured, self-reported variables and accuracy on a proofreading task as the performance variable. Through path analysis, they found significant links between positive mood and self-efficacy, and self-efficacy and performance. It is assumed, however, that the links between positive mood and performance and negative mood and performance were not significant because the authors did not report them. This pattern of results indicates that positive mood has an indirect effect on performance through self-efficacy. Interestingly, negative mood was not found to have an effect on self-efficacy. This null result was probably due to the fact that negative mood was not as intense in this study as positive mood. The mean for negative mood was much lower than the mean for positive mood. In addition, the variable, goal-performance discrepancy, was hypothesized to predict both negative and positive mood. However, it only predicted positive mood. Without a strong manipulation of
both moods, it is unclear whether positive and negative mood both have an effect on self-efficacy directly and performance indirectly.

Fortunately, Hill and Ward (1989) were able to accomplish this feat. They manipulated positive and negative mood and also found self-efficacy to serve as a mediator. They conducted a path analysis model and found that self-efficacy mediated the effect between mood and decision effort. That is, positive mood led to higher self-efficacy ($b = .36$), which in turn led to increased decision effort ($b = .27$). Negative mood, on the other hand, led to lower self-efficacy, which in turn led to decreased decision effort. When controlling for self-efficacy, the loading between mood and decision effort was not significant ($b = .11$), again suggesting that the relationship is fully mediated by self-efficacy.

Mood has not always been found to have an effect on self-efficacy. In a series of experiments, Cervone, Kopp, Schaumann, and Scott (1994) consistently found that mood did not significantly relate to self-efficacy judgments. Instead, they found mood influenced standards for performance. Specifically, they found that negative mood led to higher standards for performance, producing a greater discrepancy between self-efficacy and standards. Although they did not test this, the authors reasoned that this discrepancy serves to reduce effort and consequently performance.

In summary, most studies have found that positive mood leads to high self-efficacy and negative mood leads to low self-efficacy. This general finding is tempered somewhat by Cervone et al.'s contradictory results. Therefore, in the hypothesis section, competing models will be presented. The model I have proposed depicts self-efficacy mediating the relationship between mood
and performance, whereas the competing model depicts mood affecting performance directly and having no effect on self-efficacy.

**Mood and Attributions**

The general finding for positive mood has been that it promotes a self-serving bias (i.e., individuals ascribe success feedback to internal and stable causes). The findings on negative mood, on the other hand, have not been quite so conclusive. As you will see, negative mood sometimes results in stable causes, and other times results in external and unstable causes.

Brown (1984) found that individuals perceived success feedback as more stable than failure feedback. Individuals in a negative mood, however, perceived success and failure equally low on stability. Brown explains that the effect of mood on attributions is mediated through what he termed initial task expectancies. That is, any match between anticipated and obtained outcomes results in attributions of stability. As evidenced in the earlier review of self-efficacy and mood, individuals in a positive mood tend to be more confident of success on a task than individuals in a negative mood. Therefore, individuals in a positive mood are more likely to attribute success to stable causes (because they expected it) and failure to unstable causes (because they did not expect it). Individuals in a negative mood, however, are not sure of how well they will perform, so they attribute both success and failure to unstable causes. Indeed, Brown found a strong positive correlation ($r = .35$) between initial task expectancy and stability ratings following success, and a strong negative correlation ($r = -.26$) following failure. That is, the more certain one initially was of success, the greater the tendency to attribute success to stable causes and failure to unstable causes. It is important to note that, although task or outcome expectancy is related to the construct of self-
efficacy, it is conceptually a bit different. Outcome expectancies are predicated on the characteristics of the environment (e.g., "the test was unfair"), whereas self-efficacy is more relevant to the abilities of the person (Rosenbaum & Hadari, 1985). Nevertheless, Brown’s findings are important in developing the interrelationships among mood, performance, self-efficacy, and attributions.

Contrary to Brown’s theory, Baumgardner and Arkin (1988) proposed what they termed the self-regulation theory, which states that individuals are motivated to regulate their emotions cognitively. That is, individuals in a positive mood are motivated to remain in their mood (called mood maintenance) and will assume personal responsibility for success and deny personal responsibility for failure as a means for doing so. Individuals in a negative mood make attributions in the same manner because they are motivated to get out of their mood (called mood repair). Therefore, the authors hypothesized that positive and negative mood would produce higher internal attributions (sum of ability and effort) for success and lower internal attributions for failure than neutral mood.

Baumgardner and Arkin found limited support for their theory. For the success feedback condition, subjects in the positive mood and negative mood conditions reported more internal attributions than subjects in the neutral mood condition. However, for the failure feedback condition, subjects in positive and negative moods did not give lower internal attributions than subjects in a neutral mood. The authors reasoned that this conflicting result may have occurred because negative mood has been found to instigate more controlled or thoughtful processing, which serves to wipe
out any effect of mood. Of course, there is no way of telling this from their study.

In direct contradiction to the motivationally based self-regulation theory, Forgas, Bower, and Moylan (1990) found strong support for a more cognitively oriented theory, entitled the associative network theory (Bower, 1981). According to this theory, mood influences social judgments such as attributions because of the "...inherently complex and ambiguous character of most social situations and the necessarily selective, top-down, inferential and constructive nature of most social judgments (Forgas et al., 1990, p. 810). Through selective priming, recall, and interpretation of mood consistent information, mood is posited to influence social judgments in a mood-consistent direction. That is, individuals in a positive mood should make more positive, lenient, and favorable judgments and attributions than people in a negative mood.

In a series of experiments, Forgas et al. found consistent support for this theory. In experiment 1, subjects completed a "life-dilemma" task, in which they read achievement scenarios describing individuals' performances on complex, realistic tasks such as succeeding in a new job, passing a test, or winning a game. At the end of each scenario, a paragraph described the risky/cautious choice made by the individual and the ensuing success/failure outcome. Collectively, the stories represented all possible combinations of choice and outcome (i.e., risky-successful, risky-failure, cautious-successful, and cautious-failure). Subjects' attributions were measured by having them indicate how important each of the four causal factors of ability, effort, situation, and luck were in explaining the outcome of the story. Forgas et al. found that subjects in a positive mood provided more internal (ability +
effort - situation - luck) and stable (ability + situation - effort - luck) attributions for the outcome than subjects in a negative mood. The control group (no mood manipulation) gave attribution ratings in-between the two mood conditions.

Forgas et al. found a very interesting effect in their second experiment. This time subjects were asked to make attributions to performance on an exam that they took earlier. In addition to making attributions for their own performance, the subjects were asked to make attributions for other subjects' performances. As expected, subjects in a positive mood gave themselves internal attributions for success and external attributions for failure. This same pattern emerged when making attributions for others. Thus, subjects in a good mood exhibited a positivity bias and a relative decrease in the ego-protecting attribution error (i.e., attributing other's failures to internal causes and successes to external causes to make yourself look better). This finding would also be expected under the self-regulation theory, where individuals are motivated to remain in a good mood. The results for negative mood, however, contradict the self-regulation theory. Subjects in a negative mood were very critical of themselves by making more internal attributions for their own failures and more external attributions for their successes. In contrast, they gave internal causes for success and external causes for failure when judging others. Thus, it did not seem that individuals were motivated to "repair" their mood, instead giving attributions that were consistent with their mood state.
HYPOTHESES

Dimensionality of Mood

Based on the research by Watson and Clark (1984) and Tellegen (1982), it is expected that the construct of mood will consist of a positive mood factor and a negative mood factor. Watson, Clark, and Tellegen also assert that these two constructs are independent from each other and, therefore, would not correlate with each other in a confirmatory factor analysis. However, work by Spector et al. (1995) contradicts this assertion. They found that this seeming independence is due to the artifactual nature of the mood scales that have been used. According to Spector et al., a mood scale that represents the whole range of mood intensity (e.g., neutral mood, slightly negative mood, slightly positive mood) should produce two factors that are correlated. These competing hypotheses will be tested by comparing results from a mood scale (entitled the Composite Mood Checklist) (CMC) constructed according to recommendations by Spector et al. (1995) to a mood scale that has been used as a basis for the bidimensionality of mood (i.e., the Positive Affect and Negative Affect Schedule). Based on Spector et al.'s work, the following hypotheses are submitted:

Hypothesis 1a. Traditionally based mood scales such as the Positive Affect and Negative Affect Schedule (PANAS), will produce a negative mood factor and a positive mood factor that are independent from each other.

Hypothesis 1b. A mood scale that measures the full range of mood will produce a negative mood factor and a positive mood factor that are significantly related in a negative direction.
Mood and Performance Model

The literature reviewed above will be used to form hypotheses about the interrelationships among the key variables of mood, self-efficacy, performance, perceived performance. In looking at Figure 1 again, a number of general relationships become evident. Self-efficacy is predicted to serve as a full mediator between the relationship of mood and performance. Likewise, self-efficacy is expected to serve as a mediator between mood and perceived performance.

The associative network theory (Bower, 1981) is posited to account for these effects. Recall that according to this theory, mood effects are said to occur in a consistent direction (i.e., positive moods lead to more favorable judgments and better performance; negative moods lead to harsher judgments and worse performance). This mood consistency is termed the mood congruency effect, which results from two related phenomena: selective learning and emotional intensity. Selective learning occurs when information congruent with our present mood (i.e., positive information-positive mood; negative information-negative mood) becomes salient by reminding us of affectively similar events in our lives. Such reminding enhances our memory of the information because as Bower reasons, "...the old memory allows one to elaborate on the input event or to infuse it with greater emotion." (1981, p. 144).

Emotional intensity is also a factor in the mood congruency effect. It refers to fluctuations in the intensity of felt emotions relative to the valence of presented material, so that, "happy subjects would come down from their euphoria somewhat when they read about a funeral or unjust suffering, whereas these topics would intensify sad subjects' feelings" (Bower, 1981, p. 
Assuming that events associated with mood intensity are more easily recalled, which Bower among others (see Dutta & Kanungo, 1967, 1975) finds support for, this hypothesis holds merit. This theory, along with the numerous studies cited in the literature review, is used to develop the specific hypotheses presented below. In Figure 2, you can see that these hypotheses have been linked back to the mood model by putting the number corresponding to each hypothesis with the appropriate path in the model.

Insert Figure 2 about here

Mood, Self-Efficacy, and Performance. Studies by Kavanagh and Bower (1985), Hill and Ward (1989), and Quade and Williams (1994) will serve as a basis for hypotheses concerning mood and self-efficacy. Recall that in all three cases, the researchers found that positive mood led to higher levels of self-efficacy and negative mood led to lower levels of self-efficacy. Recall that Kavanagh and Hausfeld (1986) found somewhat conflicting results in that mood did not predict self-efficacy on a handgrip task. Although it cannot be determined from their study, this failure to predict was probably a consequence of subjects perceiving the task to be independent from effort. In the present study, the psychomotor tasks require much effort, therefore mood effects on self-efficacy should emerge.

In turn, self-efficacy should affect performance and, more specifically, should serve as a mediator between mood and performance. Recall Hill and Ward (1989) found through a path analysis technique that self-efficacy mediated the relationship between mood and decision making effort.
Similarly, Quade and Williams (1994) found self-efficacy to fully mediate the relationship between mood and performance on a proofreading task. In both cases, positive mood increased effort (performance) only when self-efficacy was high, and negative mood decreased effort (performance) only when self-efficacy was low. Given all of these findings, the following hypothesis is submitted:

**Hypothesis 2.** Self-efficacy will mediate the relationship between mood and performance. That is, mood will indirectly affect performance through self-efficacy. Thus, higher mood will lead to higher self-efficacy, which in turn will lead to greater performance.

Hypothesis 2 will be tested against a competing model (see Figure 3) in which mood does not influence self-efficacy and, instead, links directly to performance. This competing hypothesis stems from Cervone et al. ’s (1994) study, which found that mood affected performance, but did not influence self-efficacy. Instead, they found that negative mood induced higher standards for performance, which reduced motivation and consequently performance. Again, support for this finding would occur if mood loaded on performance, but not on self-efficacy.

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Insert Figure 3 about here

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**Performance and Perceived Performance.** It is expected that actual performance will predict subjects' perceptions of their performance. The common belief has been that self-evaluations of performance tend to be inaccurate because individuals are motivated to present themselves in a
positive light (i.e., self-enhancement). A meta-analysis by Mabe and West (1982), however, contradicts this notion. They analyzed 55 studies and found a median correlation of .31 between self-evaluations of performance and objective criteria of performance. In addition, they found that out of the 21 studies that examined self-enhancement bias, four indicated no overestimation tendencies and three actually indicated a tendency for subjects to underestimate their ability. The authors concluded that gross generalizations concerning people’s tendency to overestimate their abilities are unwarranted. Thus, it would appear that some convergence exists between actual performance and self-perceived performance. Therefore, the following hypothesis is submitted:

**Hypothesis 3.** Actual performance levels will positively affect subjects’ perceived performance levels.

**Mood, Self-Efficacy, and Perceived Performance.** Although it has already been hypothesized that actual performance will affect perceived performance, a one-to-one correspondence between these variables is not expected. The test batteries are difficult and somewhat ambiguous in terms of judging one’s own performance level, which leaves perceptions of performance open to influence from other variables. In the context of the present study, it is expected that mood will influence perceived performance through self-efficacy much in the same manner that mood influences performance through self-efficacy. Thus, mood is expected to influence perceived performance in a mood consistent direction. That is, positive mood will lead to higher self-efficacy, which will lead to higher perceptions of
performance, and negative mood will do just the opposite. This expected mood consistent pattern is based on the associative network theory (Bower, 1981) discussed earlier. This expected pattern is also based on results from Isen and Shalker (1982), who found that subjects evaluated ambiguous stimuli in mood consistent directions. Thus, the following hypothesis is submitted:

_Hypothesis 4. Self-efficacy will mediate the relationship between mood and perceived performance. That is, mood will indirectly affect perceived performance through self-efficacy. Thus, higher mood will lead to higher self-efficacy, which in turn will lead to higher perceived performance._

Mood and Attributions

Forgas, Bower, and Moylan’s (1990) series of experiments are the most telling in determining the effects of mood on attributions. In each case, they found evidence that positive mood led to a self-serving bias, whereas negative mood led to self-critical judgments. Specifically, subjects in a positive mood made internal and stable attributions for good performance and external and unstable attributions for poor performance. Subjects in a negative mood did just the opposite. These results are contradictory of Baumgardner and Arkin’s (1988) self-regulation theory, in which negative mood is predicted to also result in a self-serving bias because individuals are motivated to “repair” their negative mood state. However, their results were weak and hard to interpret, therefore their theory will not be used as a basis for hypotheses.
Another interesting phenomenon in the mood-attribution literature was Brown’s (1994) finding that initial task expectancies mediated the relationship between mood and attribution. Specifically, when expectancies matched outcome, attributions of stability were given; when expectancies did not match outcome, less stable attributions were given. Although, as pointed out earlier in the literature review, initial task expectancies are conceptually different than self-efficacy, they are often operationalized in the same manner (i.e., confidence ratings of how well one will perform on a task). Therefore, the following hypotheses are submitted:

Hypothesis 5a. The relationship between mood and locus of control attributions will be moderated by perceived performance. When perceived performance is low, mood will negatively load on locus of control. When perceived performance is high, mood will positively load on locus of control.

Hypothesis 5b. The relationship between mood and controllability attributions will be moderated by perceived performance. When perceived performance is low, mood will negatively load on controllability. When perceived performance is high, mood will positively load on controllability.

Hypothesis 5c. The relationship between mood and stability attributions will be moderated by perceived performance. When perceived performance is low, mood will negatively load on stability. When perceived performance is high, mood will positively load on stability.
METHOD

Design

Subjects were randomly assigned to either a positive mood or negative mood condition.

Subjects

Subjects consisted of 302 (181 males and 121 females) Air Force recruits at Lackland Air Force Base. Participation in the experiment was on a voluntary basis only.

Testing Facility

The study was conducted at the Raymond E. Cristal Test Development Center at Lackland Air Force Base. It consists of 3 rooms with 30 to 50 testing stations in each of them. The stations used in the present study contained a microcomputer system, a standard keyboard for response entry, two joysticks and two foot pedals for psychomotor response entry, and a display monitor.

Procedure

Subjects were run in groups of 39. Upon arrival, the subjects were seated across the hall from the computer testing room. There, two proctors posing as researchers for separate experiments presented the cover story to the subjects. The first proctor informed the subjects that in the interest of time they would be participating in two unrelated experiments. The proctor went on to fictiously describe the first experiment by telling the subjects that it was concerned with memory recall for emotion inducing movies, and would entail watching a video clip and then later during the second experiment, respond to computer images of the film by indicating whether each particular scene occurred in the clip.
The second proctor then described the second, ostensibly unrelated experiment. The proctor informed them that they would be taking some computerized tests that measure hand-eye coordination and reaction time. The proctor further informed the subjects that the Air Force is interested in using these tests for selection and classification, but would like to gather more information beforehand.

After giving these descriptions, the first proctor showed either the positive mood or negative mood video clip. After watching the video, the subjects were led across the hall to the testing room, where they were each seated at a computer. Their first task was to complete two different mood scales (the Positive Affect and Negative Affect Schedule and the Composite Mood Checklist), which asked them to indicate how they were currently feeling. Next, they completed the self-efficacy scale by indicating how they thought they would perform on the upcoming tests. Subjects were then administered four different psychomotor tests. After completing each test, subjects were presented with three different pictures on the computer screen. Each picture was shown for 10 seconds, after which, subjects were asked to indicate whether the image was present in the video clip they saw earlier. These pictures served to help maintain the subjects' targeted mood states throughout the testing session.

After completing all of the psychomotor tests, subjects were asked to indicate how well they thought they performed by responding to the perceived performance scale. Next, subjects were asked to respond to the attribution scale, indicating whether their performance on the tests was due to internal vs. external, stable vs. unstable, and controllable vs. uncontrollable factors. Subjects were then given the Composite Mood Checklist (CMC) a
second time to see if they were still in their targeted mood state. At the conclusion, subjects were debriefed on the true nature of the experiment.

Mood Induction

A technique similar to Forgas (1990) was used to induce mood. Positive mood was induced by showing a 20 minute video clip of various highlights from The Tonight Show with Johnny Carson. Videos of this type have been very successful in inducing a positive mood state (Kraiger, Billings, & Isen, 1989). Negative mood was induced by showing particularly disturbing scenes from the movie Platoon. This clip lasted about 23 minutes. In order to maintain subjects' mood state throughout the testing session, various pictures from the movie were presented on the computer at the testing station after subjects completed each psychomotor test (see Appendices A and B for a look at some of these pictures).

A pilot study examining the effects of these videos on mood was conducted. 57 students recruited from psychology classes were randomly assigned to watch either the Carson video or the Platoon video. After watching the video, they filled out the Composite Mood Checklist (CMC — see next section for a description). Results showed that the mean for the Carson video group (4.90) was significantly higher (t = -10.35, p < .05) than the mean for the Platoon video group (2.76). This finding indicates that the videos are indeed strong manipulators of mood.

Mood Measurement

Two different mood scales were administered in the experiment. The first scale was the Positive Affect and Negative Affect Schedule (PANAS) mood survey, developed by Watson, Clark, and Tellegen (1988). The PANAS consists of 10 positive mood descriptors (interested, excited, strong,
enthusiastic, proud, alert, inspired, determined, attentive, active) and 10 negative mood descriptors (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, afraid). Subjects were asked to respond to these descriptors by indicating on a 5-point scale (1 = very slightly or not at all, 5 = extremely) the extent to which each item describes how they currently feel (see Appendix C). A positive mood score was computed by taking the average of the responses on all of the positive mood descriptors, and a negative mood score was computed by taking the average of the responses on all of the negative mood descriptors.

After completing the PANAS scale, subjects were given a newly created scale entitled the Composite Mood Checklist (CMC). A stimulus-centered scaling study was conducted in order to adequately construct the CMC. In this study, 75 subjects were presented with 40 different mood terms (e.g., sad, upset, enthusiastic, calm). They were asked to indicate where each term fell on a 7-point scale ranging from (1) extremely negative mood to (7) extremely positive mood (see Appendix D). The means and standard deviations for the mood terms are presented in Table 1.

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Insert Table 1 about here
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The mood terms with an asterisk by them were selected to represent the CMC. They were selected because as a whole they represented the full range of mood intensity and direction, and they had relatively low standard deviations (all less than .90). There were 1 extremely negative, 5 moderately negative, 4 slightly negative, 4 neutral, 3 slightly positive, 4 moderately
positive, and 1 extremely positive terms for a total of 22 (see Appendix E). These terms were presented in a checklist format. Subjects were instructed to check all terms that described how they were feeling at the present moment. The mean for each term represented its stimulus value, and the mean of all of the terms that were checked represented a person’s mood score. For example, if someone placed a checkmark next to the terms sad and upset, their mood score would be 2.08 (2.12 + 2.04/2). Thus, a higher score represents a more positive mood.

**Self-Efficacy**

Before taking the test battery, subjects were asked to indicate their expectations of performance on the tests. A scale similar to the one found in Cervone, Kopp, Schaumann, and Scott (1994) was used. Specifically, subjects were asked to respond to the statement, “I am confident that I will perform well on this test” by circling one of the following: (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree. They were also asked to respond to the statement, “Relative to other individuals taking this test, I feel I will perform” by circling one of the following: (1) at least as well as some people (2) better than some people, (3) as well as most people, (4) better than most people, (5) better than all other people (see Appendix F).

**Performance Perceptions**

Subjects’ perceptions of their performance were measured after completing the test battery. They were asked to indicate on a 5 point scale, ranging from (1) very poor to (5) very good, how they felt they performed on each of the four tests they just took. In addition, they were asked to indicate their overall performance (see Appendix G).
Attributions Scale

As pointed out by Curren and Harich (1993), conceptions of what is considered internal/external or stable/unstable may vary across subjects. Curren and Harich state, “Although most people may view ability as internal and stable, and effort as internal and unstable, it is conceivable that students may believe abilities are learned (unstable) or that they themselves always try hard (stable).” To avoid this potential confound, the Causal Dimension Scale (Russell, 1982) was used, which asked for responses to the dimensions, locus, stability, and controllability, rather than ability or effort. Three 9-point semantic differential scales were used to represent each dimension (see Appendix H).

Psychomotor Performance

The psychomotor tests were designed to measure abilities that include coordinated movements of two or more limbs, precisely controlled movements in response to dynamic stimuli, speeded movements, and steadiness of arm and hand movements. These tests were based on a larger taxonomy developed by Fleishman (1972), in which he described eleven psychomotor ability factors. The factors thought to be most related to Air Force tasks were measured in the present study. These factors were control precision, multilimb coordination, response orientation, and rate control. See Table 2 for a description of these factors and their respective indicators (i.e., subtests).

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Insert Table 2 about here
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RESULTS

Manipulation Check

A 2 (positive vs. negative mood) x 2 (male vs. female) between subjects analysis of variance was conducted in order to determine whether the mood manipulation had its desired effect. The Composite Mood Checklist (CMC) administered at time 1 served as the dependent variable. As expected, the main effect for mood was significant ($F = 6.64[1, 298] \ p < .05$). The main effect for sex ($F = .62[1, 298], \text{ns}$) and the mood by sex interaction ($F = 1.89[1, 298], \text{ns}$) were not significant. In order to ensure the main effect for mood was in the correct direction, a planned comparison was made between the positive mood and negative mood groups. Indeed, the mean score ($m = 4.72$) for the elated mood group was significantly higher than the mean score ($m = 4.49$) for the depressed mood group ($t = -2.58[1, 298], \ p < .05$). However, a look at the means for the two groups reveal that the difference between the mood groups was quite small, and the negative mood induction resulted in more of a neutral mood than a depressed one. This small difference is also evident when looking at the distributions for each mood group. As shown in Figure 4, the distribution for the positive mood group overlapped quite a bit with the distribution for the negative mood group (i.e., scores from the positive mood group ranged from 2.29 to 5.69; similarly, scores from the negative mood group ranged from 2.16 to 5.64). Consequently, the effect size for mood was quite small ($\eta^2 = .02$). It will become evident that this small effect has implications for when testing the mood predictor hypotheses.
Model Testing

In order to test the remaining hypotheses, LISREL analyses examining relationships among the latent variables were employed. There are two major assumptions in LISREL. One is that all variables tested are continuous. This is a basic assumption in any parametric analysis, which is a typical analysis conducted in psychological research. A second assumption is multivariate normality. That is, the variables as a whole are not skewed and have a kurtosis equivalent to a normal curve. Conventional wisdom (West, Finch, & Curran, 1995) states that a relative kurtosis value of less than 7 and skewness values of less than 2 are indicative of multivariate normality. The skewness of each variable was checked with PRELIS. Only one of the variables had a skewness above 2 (Response Orientation psychomotor test skewness = 2.07). Kurtosis was examined with the Mardia test (Joreskog & Sorbom, 1989), which produced a relative kurtosis value of .115. The kurtosis value in the present study was clearly less than 7, therefore it was concluded that the assumption of multivariate normality was met.

Assessment of model fit was determined through (1) examination of the solution, (2) measures of overall fit, and (3) a comparison to a competing model. Examination of the solution entails a look at the parameter estimates to make sure they have the right sign and are significant. Measures of overall fit were determined using Chi-square ($\chi^2$), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and Root Mean Squared Residual
(RMSR) tests. Comparisons to competing models are made by testing the differences between the $\chi^2$ values of each model.

A significant chi-square statistic indicates that the model fits the data poorly. This statistic is notorious for being influenced by extreme sample sizes (i.e., if the sample is extremely large, the $\chi^2$ is likely to be significant; if the sample is extremely small, the $\chi^2$ is likely not to be significant). Thus, $\chi^2$s with large sample sizes can make a good model fit seem poor, and $\chi^2$s with small sample sizes can make a poor model fit seem good. Fortunately, the $\chi^2$ is not expected to be biased in the present study, because the sample size ($N = 302$) is not extremely large or small. The GFI indicates the relative amount of variances and covariances accounted for by the model. It ranges from zero to one, with a value of one representing perfect fit. The AGFI adjusts for degrees of freedom and also ranges from zero to one. Both fit indices are generally not influenced by sample size. The RMSR represents the average discrepancy between the fitted data matrix and the sample data matrix. Thus, lower values indicate better fit.

**Dimensionality of Mood.** Recall that some discrepancy exists between whether mood constitutes two factors of positive mood and negative mood that are truly independent (Tellegen, 1985; Watson & Clark, 1984) or only appear that way due to the artifactual nature of most mood scales (Spector, 1995). The latter proposition was tested by conducting confirmatory factor analyses on the Positive Affect and Negative Affect Schedule (PANAS) mood survey and the newly created Composite Mood Checklist (CMC). The correlation matrix for all of the mood scales are presented in Table 3.
Hypothesis 1a stated that a traditionally based mood scale such as the PANAS would result in a positive mood factor and negative mood factor that were independent from each other (i.e., uncorrelated). This hypothesis was tested by comparing a model in which the link between the positive mood factor and negative mood factor is fixed to zero (i.e., factors are independent) to a model in which the link between the mood factors is estimated (i.e., factors are related). According to this hypothesis, the two models should produce equivalent fits, because the association between the mood factors will essentially be zero. This was indeed the case. The fit indices (see Table 4) did not differ from each other significantly ($\chi^2 = 3.18[1], \text{ ns}$), indicating that one model did not fit the data better than the other. In addition, an examination of the path estimate ($\beta = -.12$) between the two factors revealed that it was not not significant ($t = -1.72, \text{ ns}$), lending more evidence that the mood factors were independent from each other. For a look at the measurement loadings, see Figure 5.

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Insert Table 3 about here

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Insert Table 4 about here

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Insert Figure 5 about here
Hypothesis 1b also received support. This hypothesis stated that the CMC, which measures the full range of mood, will produce a positive mood factor and a negative mood factor that are significantly and negatively related to each other. Thus, a model in which the link between the two mood factors is estimated should produce a better fit than a model in which the link between the two mood factors is fixed to zero. A look at the fit indices for these models in Table 4 indicates this was the case. The former model did indeed fit the data better ($\chi^2 = 23.42[1], p < .05$). In addition, the loading ($\beta = -.33$) between the two factors was significant and negative ($t = -3.61, p < .05$), lending more evidence that the mood factors were related. For a look at the measurement loadings, see Figure 6.

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Insert Figure 6 about here

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The reader may have noticed that none of the models for either mood scale fit the data very well. These poor fits are likely due to the oversimplified factor structure (i.e., positive and negative) imposed on the analyses. In reality, the scales consist of roughly four factors (positive, sad, angry, anxious). The reason only two factors were modeled was to test the theory that positive mood is independent from negative mood.

Recall that Spector et al. (1995) posited that the reason the PANAS results in two factors that are uncorrelated is because of the principle of unfolding. That is, given a particular item, people whose standing is either higher or lower than the item will be likely to disagree with it. This phenomenon produces a simplex pattern, in which correlations among item
types (i.e., extremely positive, moderately positive, slightly positive, etc.) will become smaller the further apart the item types are from each other (i.e., the further down and the further left in a correlation matrix). In order to determine whether unfolding occurred in the present study, an intercorrelation matrix was computed for the CMC. In order to more easily determine a simplex pattern, means for each item type were computed, producing a $7 \times 7$ correlation matrix (see Table 5). Averaged within item type correlations were also included in the matrix. Note that there was only one item each for the extremely positive and extremely negative item types, therefore no within item type correlation could be computed for these item types.

Insert Table 5 about here

The correlation matrix indicates that, for the most part, a simplex pattern did occur. In almost every instance, the correlation coefficients get smaller as you move down in the matrix and as you move left in the matrix. Therefore, unfolding did seem to occur.

**Mood and Performance Model.** The model presented in Figure 2 was tested through LISREL. Descriptive statistics of the variables tested in this model are presented in Table 6. Note that two of the performance variables were transformed such that their standard deviations were more similar to the other variables. Specifically, the response orientation test (RO2) was divided by 1,000 to produce a reaction time in seconds, and the Rate Control test (RC1) was divided by 100.
The correlation matrix of these same variables are presented in Table 7. The overall fit of this model to the data was quite poor. As shown in Table 8, only the GFI (.92) was within an acceptable range. The $\chi^2 (173.32, N = 302, p < .05)$ was highly significant, the AGFI (.87) was below the .9 criterion, and the RMSR (.15) was above the .10 criterion.

In order to test the specific hypotheses, the path loadings were examined. Figure 7 depicts the mood and performance model with its path loadings.

Hypothesis 2 stated that the effect of mood on performance would be mediated by self-efficacy. As evidenced in Figure 7, however, this hypothesis was not supported. In order for self-efficacy to be considered a mediator, the loadings between mood and self-efficacy, self-efficacy and performance, and
the indirect effect of mood on performance must all be significant. Although
the loading between self-efficacy and performance ($\beta = .35$) was significant ($t = 3.85, p < .05$), the loading between mood and self-efficacy ($\beta = -.03$) and the
indirect effect of mood on performance ($\beta = -.02$) were not significant ($t = -.38$
and $t = -.42$ respectively). Therefore, it does not appear that self-efficacy
mediated the relationship between mood and performance.

Recall that as a further test of hypothesis 2, a competing model (see
Figure 3) was established in which mood was not linked to self-efficacy and
instead was linked directly with performance. This model was also analyzed
with LISREL. Much like the hypothesized model, the competing model did
not receive much support. A look at its fit indices in Table 8 shows that they
are very similar to the fit indices for the hypothesized mediating model.
Again, only the GFI (.92) was within an acceptable range. A look at the path
diagram in Figure 8 shows that the loading between mood and performance
($\beta = -.03$) was not significant ($t = -.49$, ns). Thus, mood did not have an effect
on either self-efficacy or performance.

[Insert Figure 8 about here]

Hypothesis 3 stated that actual performance levels will affect perceived
performance. This hypothesis was supported as the loading between
performance and perceived performance ($\beta = .39$) was significant ($t = 5.29$).

Hypothesis 4 stated that the relationship between mood and perceived
performance would be mediated by self-efficacy. This hypothesis did not
receive support as only the effect of self-efficacy on perceived performance ($\beta$
=.28) was significant (t = 3.26). Recall that the loading for mood on self-efficacy was not significant. The indirect effect of mood on perceived performance (β = -.02) was also not significant (t = -.43).

One possible reason for the insignificant findings surrounding mood is that the mood manipulation was not strong enough. Recall that the mean mood score for the negative mood group was only slightly lower than the mean for the positive mood group. In fact, the negative mood group seemed to be in more of a neutral mood than a negative one. However, it does not seem likely that even if the manipulation was stronger, mood effects would surface. A look at the correlation matrix in Table 9, shows that the CMC scores at time 1 do not significantly correlate with any of the self-efficacy items, performance tests, or perceived performance items.

_________ ______________
Insert Table 9 about here
_________ ______________

The CMC scores at time 2 (i.e., at the end of the experiment), on the other hand, significantly correlated with all of the variables. This finding implies that the causal direction between mood and these variables is actually reversed (i.e., performance affects mood, but mood does not affect performance). In order to assess this proposition, a LISREL analysis was conducted on a post hoc model in which performance and perceived performance are depicted as affecting mood. The path diagram for this model is presented in Figure 9.
Interestingly, every loading in this model was significant. That is, self-efficacy affected performance and perceived performance, performance affected perceived performance, and performance and perceived performance affected mood. A preliminary look at the fit indices in Table 9 indicates that the model did not fit the data very well. Only the GFI (.92) was within an acceptable range. Given all of the significant loadings, this result was puzzling. Therefore, a saturated model (i.e., all possible parameters are estimated) was tested to determine what the maximum fit could be and whether this fit was markedly different from the proposed model. A look again at Table 9 shows that the fit indices for the saturated model did not seem to differ greatly. Thus, the post hoc model appears to be a relatively good fit.

Mood and Attributions. In order to test the moderating effect of perceived performance on the relationship between mood and attributions, a median split was performed on the mean score for the perceived performance scale. The median was 3.00. Subjects whose mean score was greater than 3 were placed into the high perceived performance group (n = 138), and subjects who score 3 or less were placed into the low perceived performance group (n = 164). Correlation matrices for each group are presented in Table 10.
A separate LISREL analysis was performed for each group. The model tested had mood affecting three different attribution variables: locus of control, controllability, and stability.

For the low perceived performance group, mood was not found to significantly affect any of the attribution variables. The path diagram in Figure 7 illustrates this finding.

\[ \text{Insert Figure 7 about here} \]

The fit indices also indicate a poor fit of the model. As shown in Table 11, only the CFI (.91) was within the acceptable range of fit.

\[ \text{Insert Table 11 about here} \]

Similar results were found for the high perceived performance group. Hypothesis 6b stated that when perceived performance was high, the loadings between mood and the attribution variables would be significant and positive. A look at the path diagram in Figure 7 shows that none of the loadings were significant. The fit indices were also quite poor (see Table 11). Therefore, hypothesis 6b did not receive support.

These results were not surprising given the relatively weak manipulation of mood. Furthermore, a look again at the correlation matrix in Table 3 reveals that mood condition did not correlate significantly with the
CMC scores at the end of the experiment. This weak relationship implies mood condition did not accurately reflect the mood subjects were actually in at the time they filled out the attribution scale. Therefore, the actual mood scores on the CMC at time 2 were used as the predictor to more adequately test hypotheses 6a and 6b. For the low perceived performance group, none of the findings were significant (see Figure 8), and the fit indices were poor (see Table 9).

---

Insert Figure 8 about here

---

Therefore, no support was found for the hypothesis that when perceived performance is low, mood will negatively load on attributions. For the high perceived performance group, two of the loadings were significant: mood and locus of control (β = .26, t = 2.41, p < .05) and mood and stability (β = .14, t = 2.22, p < .05). The loading for mood and controllability was in the right direction (β = .14), but did not quite reach significance (t = 1.17, ns). The fit indices again were quite poor (see Table 11), but this was partly due to the fact that stability items 2 and 3 did not load significantly on the latent variable, stability.
DISCUSSION

Summary

The purposes of this study were two fold. The first purpose was to examine whether positive and negative mood are independent constructs. There has been some controversy surrounding this issue, and the present study was conducted to help elucidate this topic. The second and main purpose of the present study was to examine the effects of mood on psychomotor performance and how it interacts with related constructs such as self-efficacy, perceived performance, and attributions. The associative network theory (Bower, 1981) served as a basis for the model that was tested (see Figure 1). This theory is premised on the mood congruency effect, which states that mood effects occur in a consistent direction. That is, positive mood leads to more favorable judgments and better performance and negative mood leads to less favorable judgments and worse performance.

Dimensionality of Mood

Traditionally, mood has been conceptualized as consisting of two independent constructs of positive mood and negative mood (Watson, Clark, & Tellegen, 1988). Work by Spector et al. (1995), however, indicates that this independence may be an illusion created by artifactual mood scales. The mood scale in question consists of one set of extremely positive terms and one set of extremely negative terms, which can produce two factors based on direction type that are not correlated. Due to the unfolding principle (i.e.,
people agree with items that are close to their level on a trait and disagree with all other levels) (Andrich, 1988), people's responses will be consistent within item type, but will be inconsistent across item type. The present study supported this notion by showing that when using a traditional scale like the PANAS, the mood factors did not significantly correlate with each other. However, when using the CMC, which includes terms representing all levels of mood, the mood factors significantly correlated with each other in the expected, negative direction. In addition, a moderate simplex pattern was found when computing the intercorrelations for item types on the CMC, providing more direct evidence that unfolding occurred.

These findings make intuitive sense. It is easy to imagine someone who is high on one mood factor and low on the other, or even low on both mood factors (indicative of a neutral mood), but it is very hard to imagine too many people who are high on both factors (i.e., in a positive mood and negative mood at the same time). Based on Watson and Clark's (1984) terminology, these individuals would be excited and enthusiastic yet upset and distressed. It does not make sense to think that the frequency for this category would be equivalent to frequencies in the other categories, which is what is implied when stating that the mood factors are independent.

Indeed, data from the present study indicates that the frequencies are not equivalent. Using responses on the CMC, high positive mood was defined as endorsement of either of the extremely positive and moderately
positive terms (i.e., thrilled, happy, enthusiastic, delighted, upbeat) and high negative mood was defined as endorsement of either of the extremely negative and moderately negative terms (i.e., hostile, upset, sad, annoyed, irritable, disturbed). The percentage of subjects who were high on both dimensions (14%) was much smaller than the percentage of subjects who were high on one dimension and low on the other (high positive-low negative = 36%; low positive-high negative = 30%).

Mood and Performance

The theoretical model presented in Figure 1 was tested with LISREL. In this model, self-efficacy was hypothesized to mediate the relationships between mood and performance and mood and perceived performance, and performance was expected to influence perceived performance. In addition, perceived performance was expected to moderate the effects of mood on attributions, such that when perceived performance was high, mood would positively influence attributions; when perceived performance was low, mood would negatively influence attributions.

Very little support was found for this model. Mood was not found to have a relationship with self-efficacy. Consequently, self-efficacy did not serve as a mediator between mood and performance or mood and perceived performance. This finding runs counter to research by Kavanagh and Bower (1985) and Saavedra and Earley (1991), who in both cases found mood to have a significant effect on self-efficacy. It also contradicts research by Hill and
Ward (1989) and Quade and Williams (1994), who found that mood had indirect effects on performance through self-efficacy. In fact, the only study in which the results were not contradictory was Cervone et al.'s (1994) study, in which they consistently found that mood did not have an effect on self-efficacy. Instead, they found that mood influenced performance standards, such that positive mood led to lower standards and negative mood led to higher standards. Since standards were not measured in the present study, it is unclear whether mood would have affected this variable.

Mood also did not have an effect on attributions. For both the low and high perceived performance groups, mood did not influence locus of control, controllability, or stability attributions. These findings are inconsistent with work by Forgas et al. (1990), who found that positive mood led to more internal and stable attributions for success than negative mood.

Despite the widespread null effects surrounding mood, there were some significant findings. Performance was found to influence perceived performance, which supports Mabe and West's (1982) meta-analysis in which they found a median correlation coefficient of .31 between self-evaluations of performance and objective criteria of performance. In addition, self-efficacy was found to directly influence both performance and perceived performance. These findings support Bandura's (1982) theory of self-efficacy and its ability to predict specific performances accurately.
Nevertheless, mood as a whole was a nonfactor in this study. A number of possible explanations for this finding are discussed here. The most obvious yet least likely explanation is that mood truly does not have an effect on performance and related constructs, at least in the psychomotor domain. Past research has found mood to have an effect in performance domains such as creativity and problem solving (Greene & Noice, 1988; Isen, Daubman, & Nowicki, 1987; Kavanagh, 1987; Nicholas & Weiss, 1994), but until now, no one has looked at psychomotor performance. Perhaps only cognitively oriented tasks that involve reasoning and decision making are affected by mood, and tasks that solely require physical skills are not affected.

In relation to this point, it is possible that the inherent feedback that some of the psychomotor tasks provide, overridden potential mood effects. For example, in the multi-limb “pop the balloons” task, subjects who are in the positive mood condition but happen to be having a tough time popping the balloons will have a pretty good notion that they are not performing well. This information could affect both their confidence and mood, which could affect subsequent performance. Consequently, the fact that they were in the positive mood condition would no longer have a bearing on their performance. The multi-limb task probably most susceptible to this feedback confound. The response orientation task, which measures reaction time, is probably the least informative to subjects. Unfortunately, subjects completed this task after the multilimb task, meaning feedback would have already been
provided to them. Future studies should concentrate on using more ambiguous tasks in order to control for any confounding results from task feedback.

Another possible cause for the weak mood effects regards the motivation of the subjects. Recall that the subjects were Air Force recruits in the middle of basic training, where they are constantly being evaluated and tested. Although the subjects were explicitly informed that their performance on the psychomotor tests would not be used as a criterion for their basic training performance, some of the recruits still expressed concern at the end of the experiment. It is possible that this fear of evaluation motivated them to a great extent and wiped out, for example, any detrimental effects that negative mood might have had.

The likeliest cause for the lack of mood effects, however, relates to the relatively weak mood manipulation in this study. Although the mean differences on the manipulation check were statistically significant, they were not practically significant. The positive mood group had a mean score of 4.76 on the CMC which is indicative of a slightly positive mood. The negative mood group was not negative at all: subjects scored an average of 4.40 on the CMC, which falls somewhere between a slightly positive mood and a neutral mood. Therefore, it is quite possible that the self-efficacy and performance scores were equivalent because the mood groups were inherently equivalent.
This explanation brings up the question of why the negative mood induction was not successful. Recall that the negative mood induction was successful in the pilot study, producing a mean score of 2.76. However, the pilot sample consisted of psychology students instead of Air Force recruits. Thus, there seems to be a qualitative difference between populations. Perhaps the Air Force recruits are less emotional than the college students, because they are in a strong contextual environment in which they are being trained to be rational and in control of their emotions. There has been only one other study known to the author in which a mood induction was conducted on a military sample. Christal (1994) used the Velten technique in which Air Force recruits read either depressed or elated self-referent statements. He found no correspondence between the mood manipulations and a mood scale that was administered later.

One might question the choice using the film technique for inducing mood. Recall that there are numerous other methods for inducing mood. Methods such as the Velten, false feedback, and music have all been shown to be effective (Gerrards-Hesse et al., 1994). The film technique was chosen over the false feedback technique, because false feedback has been shown to be confounded with self-efficacy (Hill and Ward, 1989), which was an important variable in this study. It was also chosen over the Velten technique, because the Velten has been shown to be effective for only 50% to 70% of subjects (Clark, 1983). Finally, the film technique was chosen over the music.
technique, because music had the potential of distracting subjects while trying to perform the psychomotor tasks.

**Post-Hoc Analyses**

Although the mood induction in the present study did not have any effects, post-hoc analyses on the CMC mood scores taken at the end of the experiment did result in some significant findings. In fact, when treating the CMC as a criterion variable and performance and perceived performance as predictor variables, the mood and performance model was supported. Of course, the difference is that instead of mood affecting performance, performance is depicted as affecting mood. Thus, the better subjects performed on the tests (and the better they felt they performed), the more positive their mood. Certainly, this relationship is of no surprise when considering research showing that performance feedback affects mood (Gerrards-Hesse et al., 1994). That is, when individuals realize they did well on a task, they feel good; when they realize they performed poorly, they may become sad or angry. Clearly, what is still unknown is whether this reactionary mood goes on to influence subsequent performance.

In a post-hoc analysis of the attribution variables, the CMC scores were found to significantly load on some of the variables. For the low perceived performance group, the CMC scores did not significantly load on any of the attribution variables, although the loadings were in the appropriate negative direction. For the high perceived performance group, the CMC scores were
significantly and positively associated with locus of control and stability, but not controllability. Caution should be taken in interpreting the results from this analysis because CMC measurement came after the attribution scale, but was treated as a causal determinants of attributions. It is possible that the causal direction is actually reversed, although this would not make as much sense theoretically (e.g., why would attributing success to internal causes necessarily put you in a better mood than attributing success to external causes? Either way, you’re going to be happy that you performed well).

Clearly, more research needs to be conducted in the mood and performance area. Future research should examine mood effects on different populations to address the question of whether certain individuals are more susceptible to mood inductions. Larsen and Ketelaar (1989) found that personality can moderate the strength of mood inductions, such that extraverted individuals are more susceptible to positive mood inductions and neurotic individuals are more susceptible to negative mood inductions. It is possible that the Air Force sample in the present study was fundamentally different on some relevant personality variable than the college student sample in the pilot study. Further investigation into this area would prove beneficial in examining mood effects across populations.

Future research should also investigate whether the relationship between mood and psychomotor performance is bidirectional. The present study gave indication that psychomotor performance can influence mood, but
it is still not clear whether mood has an effect on psychomotor performance. This question could be examined by giving subjects a series of tasks and measuring their mood after completing each task. Caution would need to be taken in making sure the mood measurements were not too intrusive or produced demand characteristics. There are some existing methods for measuring mood that are covert, such as asking subjects to rate the pleasantness of unfamiliar words (Isen et al., 1987).

Conclusions

It is apparent that psychomotor performance has an influence on mood, but what remains to be seen is whether mood influences psychomotor performance. The findings in the present study tentatively indicate that mood does not have an effect. However, null results are always hard to interpret because there are too many different possible explanations for the results. In the present study, the likeliest explanation is that the mood manipulation was not strong enough or persistent enough. The psychomotor tests themselves altered subjects’ mood states enough so that by the end of the experiment their moods did not coincide with their intended mood state (the correlation between CMC scores at the beginning vs. the end of the experiment was .48).

As one group of authors put it, mood is an inherently sticky and cryptic construct that is imbedded in a system of similarly sticky constructs such as self-efficacy, attributions, and goal-performance discrepancies (Cropanzano &
Howes, 1994). They likened it to trying to “nail jello on the wall.” Based on this assessment, it is not surprising that null results were found in the present study. Still, we as researchers should not be daunted by the elusiveness of this construct, because mood can potentially have a substantial impact on organizational behavior in general and performance in particular. Learning more about this construct can be beneficial to organizations in two ways. First, recognizing mood effects can explain some of the error variance surrounding selection measures, which will increase the statistical power for finding predictive relationships. Second, organizations can use mood as a tool for increasing productivity by playing uplifting music, providing verbal praise, or showing funny movies on breaks.
REFERENCES


Appendix A:

Pictures from the The Best of The Tonight Show with Johnny Carson
Appendix B:

Pictures from *Platoon*
Appendix C:

Positive Affect and Negative Affect Schedule
**Feelings Scale**

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>very slightly</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
<tr>
<td>or not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

___ interested  ___ irritated
___ distressed  ___ alert
___ excited  ___ ashamed
___ upset  ___ inspired
___ strong  ___ nervous
___ guilty  ___ determined
___ scared  ___ attentive
___ hostile  ___ jittery
___ enthusiastic  ___ active
___ proud  ___ afraid
Appendix D:

Mood Term Ratings
Mood Term Ratings

Please mark 1 for male or 2 for female under Group on the scantron. Also put your age under the Seat No. column. You do not need to put your name or social security number on there.

Presented below is a list of 40 terms that are all descriptions of mood. You are to indicate what type of mood each term represents using the mood scale below.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely</td>
<td>Moderately</td>
<td>Slightly</td>
<td>Neutral</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Extremely</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td></td>
</tr>
</tbody>
</table>

For example, if you feel one of the mood terms is most indicative of a neutral mood, then you would fill in circle number 4 on the scantron.

**Mood Terms:**

1. Thrilled
2. Inspired
3. Hostile
4. Delighted
5. Happy
6. Apathetic
7. Disturbed
8. Sluggish
9. Tense
10. Enthusiastic
11. Excited
12. Jittery
13. Sad
14. So-So
15. Nervous
16. Alert
17. Active
18. Cheerful
19. Neutral
20. Sleepy
21. Guilty
22. Ashamed
23. Strong
24. Proud
25. Attentive
26. Upbeat
27. Interested
28. Uncomfortable
29. Pleased
30. Elated
31. Irritable
32. Calm
33. Bored
34. Afraid
35. Determined
36. Distressed
37. Upset
38. Fine
39. Scared
40. Annoyed
Appendix E:

Composite Mood Checklist
Feelings Checklist

Place a checkmark next to the terms below that represent how you are feeling right now.

<table>
<thead>
<tr>
<th>Thrilled</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostile</td>
<td>Upbeat</td>
</tr>
<tr>
<td>Happy</td>
<td>Interested</td>
</tr>
<tr>
<td>Sluggish</td>
<td>Uncomfortable</td>
</tr>
<tr>
<td>Disturbed</td>
<td>Pleased</td>
</tr>
<tr>
<td>Tense</td>
<td>Irritable</td>
</tr>
<tr>
<td>Enthusiastic</td>
<td>Calm</td>
</tr>
<tr>
<td>Sad</td>
<td>Apathetic</td>
</tr>
<tr>
<td>Delighted</td>
<td>Upset</td>
</tr>
<tr>
<td>Alert</td>
<td>Fine</td>
</tr>
<tr>
<td>Active</td>
<td>Annoyed</td>
</tr>
</tbody>
</table>
Appendix F:

Self-Efficacy Scale
Soon you will be performing a series of tests that require the use of a joystick and sometimes foot pedals. This test is designed to measure your hand-eye coordination and reaction time. Please answer the questions below concerning your expectations of performance on this test. We realize that it is hard to know how well you will perform on a test you have not seen yet, but please make your best estimate.

Circle the number below that best represents your response to each question.

1. I am confident that I will perform well on this test.

   1 2 3 4 5
   Strongly Disagree Neither Agree Strongly
   Disagree nor Disagree

2. Relative to other individuals taking this test, I feel I will perform:

   1 2 3 4 5
   At least as well Better than As well as Better than Better than
   as some people some people most people most people all other people
Appendix G:

Perceived Performance Scale
Perceived Performance Scale

Please indicate how you feel you performed on each of the four tests.

Test 1: Rotary Pursuit

I believe my performance was:

1 2 3 4 5
Very Poor Poor Average Good Very Good

Test 2: Pop the Balloons

I believe my performance was:

1 2 3 4 5
Very Poor Poor Average Good Very Good

Test 3: Red to Green Orientation

I believe my performance was:

1 2 3 4 5
Very Poor Poor Average Good Very Good

Test 4: Arc Pursuit

I believe my performance was:

1 2 3 4 5
Very Poor Poor Average Good Very Good
Appendix H:

Causal Dimension Scale
The Causal Dimension Scale

Instructions: Think about the reasons for your performance on the tests that you just took. The items below concern your impressions or opinions of the cause or causes of your performance. Circle one number for each of the following scales.

<table>
<thead>
<tr>
<th>1. Is the cause(s) something that: Reflects an aspect of yourself</th>
<th>9 8 7 6 5 4 3 2 1</th>
<th>Reflects an aspect of the situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Is the cause(s): Controllable by you or other people</td>
<td>9 8 7 6 5 4 3 2 1</td>
<td>Uncontrollable by you or other people</td>
</tr>
<tr>
<td>permanent</td>
<td>9 8 7 6 5 4 3 2 1</td>
<td>Temporary</td>
</tr>
<tr>
<td>outside of you</td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>Inside of you</td>
</tr>
<tr>
<td>variable over time</td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>Stable over time</td>
</tr>
<tr>
<td>something about you</td>
<td>9 8 7 6 5 4 3 2 1</td>
<td>Something about others</td>
</tr>
<tr>
<td>changeable</td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>Unchanging</td>
</tr>
<tr>
<td>no one is responsible</td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>Someone is responsible</td>
</tr>
</tbody>
</table>
Appendix I:

Figures
Figure 1

Proposed Mood and Performance Model

Note: Mood = dummy coded variable (0 = negative mood, 1 = positive mood); SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance; Attribs = Attributions Variables (Locus of Control, Controllability, and Stability).
Figure 2
Mood and Performance Model With Each Hypothesis Number Indicating the Exact Paths Being Tested

Note: Mood = dummy coded variable (0 = negative mood, 1 = positive mood); SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance; Attribs = Attributions Variables (Locus of Control, Controllability, and Stability).
Figure 3

Competing Model in Which Mood is Linked Directly With Performance

Note. Mood = dummy coded variable (0 = negative mood, 1 = positive mood); SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance.
Figure 4

Histograms of CMC Scores, Grouped by Positive and Negative Mood

**MOOD: positive**

Composite Mood Checklist

**MOOD: negative**

Composite Mood Checklist
Figure 5

Confirmatory Factor Analysis for Composite Mood Checklist
Note. TH = thrilled; HA = happy; EN = enthusiastic; DE = determined; AL = alert; AC = active; UP = upbeat; IN = interested; PL = pleased; SL = sluggish; HO = hostile; DI = disturbed; TE = tense; SA = sad; UN = uncomfortable; IR = irritable; AP = apathetic; UP = upset; AN = annoyed; NE = neutral; CA = calm; FI = fine.
Figure 6

Confirmatory Factor Analysis for the Positive Affect and Negative Affect

Schedule
Note. IN = interested; EX = excited; ST = strong; EN = enthusiastic; PR = proud; AL = alert; IS = inspired; DE = determined; AT = attentive; AC = active; DI = distressed; UP = upset; GU = guilty; SC = scared; HO = hostile; IR = irritable; AS = ashamed; NE = neutral; JI = jittery; AF = afraid.
Figure 7
Path Diagram for Mood and Performance Model

Note. Indirect effect of Mood on Performance = -.02. Indirect effect of Mood on Perceived Performance = -.02. Mood = dummy coded variable (0 = negative mood, 1 = positive mood); SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance; MM = Manipulated Mood; SE1 = self-efficacy item 1; SE2 = self-efficacy item 2; ML = multi-limb task; RO = response orientation task; CP = control precision task; RC = rate control task; PP1 - PP5 = perceived performance items 1 through 5. *p < .05.
Figure 8
Path Diagram for Competing Model in Which Mood is Directly Linked With Performance

Note: Mood = dummy coded variable (0 = negative mood, 1 = positive mood); SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance. *p < .05.
Figure 9
Path Diagram for Mood and Performance Model (CMC at Time 2 as Mood Variable)

Note: Mood = Composite Mood Checklist at Time 2; SE = Self-Efficacy; Perf = Psychomotor Performance; Perc Perf = Perceived Performance; CMC = composite mood checklist score; SE1 = self-efficacy item 1; SE2 = self-efficacy item 2; ML = multi-limb task; RO = response orientation task; CP = control precision task; RC = rate control task; PP1 - PP5 = perceived performance items 1 through 5  *p < .05.
Figure 10
Path Diagram for Mood and Attribution Model

Low Perceived Performance

High Perceived Performance
Note. Mood = dummy coded variable (0 = negative mood, 1 = positive mood), LOC = Locus of Control, CTL = Controllability, STB = Stability; MM = manipulated mood; LOC1 - LOC3 = locus of control items 1 through 3; CTL1 - CTL3 = controllability items 1 through 3; STB1 - STB3 = stability items 1 through 3.
Figure 11
Path Diagram for Mood and Attributions Model (CMC at Time 2 as Mood Variable)
Note. Mood = composite mood checklist at time 2, LOC = Locus of Control, CTL = Controllability, STB = Stability; CMC2 = composite mood checklist score; LOC1 - LOC3 = locus of control items 1 through 3; CTL1 - CTL3 = controllability items 1 through 3; STB1 - STB3 = stability items 1 through 3. *p < .05.
Appendix J:

Tables
Table 1

Descriptive Statistics for Mood Terms Used in Pilot Study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std Dev</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Hostile</td>
<td>1.35</td>
<td>.53</td>
<td>75</td>
</tr>
<tr>
<td>Ashamed</td>
<td>1.73</td>
<td>.74</td>
<td>75</td>
</tr>
<tr>
<td>*Upset</td>
<td>2.04</td>
<td>.69</td>
<td>75</td>
</tr>
<tr>
<td>*Sad</td>
<td>2.12</td>
<td>.59</td>
<td>75</td>
</tr>
<tr>
<td>Distressed</td>
<td>2.12</td>
<td>.73</td>
<td>75</td>
</tr>
<tr>
<td>Guilty</td>
<td>2.13</td>
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<td>Afraid</td>
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<td>Sleepy</td>
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<td>.75</td>
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<td>So-So</td>
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<td>*Calm</td>
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<td>*Fine</td>
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<td>*Alert</td>
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<td>Attentive</td>
<td>4.93</td>
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<td>75</td>
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<tr>
<td>*Active</td>
<td>5.04</td>
<td>.74</td>
<td>75</td>
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<td>*Interested</td>
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<td>Determined</td>
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<td>Strong</td>
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<td>75</td>
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<td>Proud</td>
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<td>75</td>
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<tr>
<td>*Happy</td>
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<td>.59</td>
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<td>Inspired</td>
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<td>*Delighted</td>
<td>6.08</td>
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<td>*Enthusiastic</td>
<td>6.23</td>
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<td>Excited</td>
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<td>Elated</td>
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<tr>
<td>*Thrilled</td>
<td>6.84</td>
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</tbody>
</table>
Table 2

Summary of Psychomotor Domains and Their Respective Tests

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Precision</td>
<td>Fine, highly controlled arm-hand and leg movements. Important in the operation of equipment that requires careful positioning of the feet and hands. It is especially critical when such movements require speed with precision.</td>
<td>CP1 - Rotary Pursuit (follow moving target using joystick)</td>
</tr>
<tr>
<td>Multilimb Coordination</td>
<td>Simultaneous coordination of two or more limbs especially when operating devices with several controls.</td>
<td>ML4 - Pop the Balloons (track &amp; pop balloons using foot pedals &amp; joystick)</td>
</tr>
<tr>
<td>Response Orientation</td>
<td>Rapid directional discrimination and orientation of movement patterns. This factor enables the selection of the correct response given a stimulus independent of either precision or coordination.</td>
<td>RO2 - Red to Green Orientation (respond with number pad keys according to a set of given rules)</td>
</tr>
<tr>
<td>Rate Control</td>
<td>Making continual corrections to a motor response to keep in synchrony with changes in the speed and direction of a continuously moving target.</td>
<td>RC1 - Arc Pursuit (keep red target between 2 yellow lines)</td>
</tr>
</tbody>
</table>
Table 3

Intercorrelations for Mood Variables

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CMC1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2. CMC2</td>
<td>.49</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3. PANAS-P</td>
<td>.66</td>
<td>.40</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4. PANAS-N</td>
<td>-.52</td>
<td>-.27</td>
<td>.27</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note.* CMC1 = Composite Mood Checklist - time 1; CMC2 = Composite Mood Checklist - time 2; PANAS-P = Positive Affect and Negative Affect Schedule - positive scale; PANAS-N = Positive Affect and Negative Affect Schedule - negative scale. Coefficients in boldface are significant at the .05 level.

Note. CMC1 = Composite Mood Checklist
Table 4

Fit Indices for Confirmatory Factor Analyses of Mood Scales

<table>
<thead>
<tr>
<th>Scale Model</th>
<th>$\chi^2$</th>
<th>GFI</th>
<th>AGFI</th>
<th>RMSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANAS (uncorr)</td>
<td>644.56</td>
<td>.81</td>
<td>.77</td>
<td>.08</td>
</tr>
<tr>
<td>PANAS (corr)</td>
<td>641.38</td>
<td>.81</td>
<td>.76</td>
<td>.08</td>
</tr>
<tr>
<td>CMC (uncorr)</td>
<td>538.69</td>
<td>.86</td>
<td>.83</td>
<td>.10</td>
</tr>
<tr>
<td>CMC (corr)</td>
<td>515.27</td>
<td>.86</td>
<td>.83</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note. PANAS (uncorr) = Model in which Positive Affect and Negative Affect Schedule is the scale and the loading between the two mood factors is fixed to zero; PANAS (corr) = Model in which Positive Affect and Negative Affect Schedule is the scale and the loading between the two mood factors is estimated; CMC(uncorr) = Model in which Composite Mood Checklist is the scale and the loading between the two mood factors is fixed to zero; CMC (corr) = Model in which Composite Mood Checklist is the scale and the loading between the two mood factors is estimated.
Table 5

Intercorrelations for Mood Items on the Composite Mood Checklist

<table>
<thead>
<tr>
<th>Measure</th>
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<th>6</th>
<th>7</th>
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</thead>
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<td>2. Mod Neg</td>
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<td></td>
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<td>3. Slight Neg</td>
<td>.07</td>
<td>.27</td>
<td>.13</td>
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<td></td>
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<tr>
<td>4. Neutral</td>
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<td>.22</td>
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<td>5. Slight Pos</td>
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<td>6. Mod Pos</td>
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<td>-.11</td>
<td>.12</td>
<td>.20</td>
<td>.37</td>
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<tr>
<td>7. Ext Pos</td>
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<td>-.06</td>
<td>.06</td>
<td>.14</td>
<td>.31</td>
<td>.35</td>
<td>___</td>
</tr>
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</table>

Note. Ext Neg = Extremely Negative; Mod Neg = Moderately Negative; Slight Neg = Slightly Negative; Slight Pos = Slightly Positive; Mod Pos = Moderately Positive; Ext Pos = Extremely Positive. Correlation coefficients reported are the mean correlation coefficients for each item type.
### Table 6

**Descriptive Statistics for Variables in Mood and Performance Model**

<table>
<thead>
<tr>
<th>Variable</th>
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<th>N</th>
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<td>CMC2</td>
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<td>0.96</td>
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</tr>
<tr>
<td>PANAS-P</td>
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<td>0.68</td>
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<tr>
<td>PANAS-N</td>
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<td>SES1</td>
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<td>ML4</td>
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<td>RC1</td>
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<td>0.44</td>
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<td>12.90</td>
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<td>CP1</td>
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<td>PPS1</td>
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<td>PPS2</td>
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<td>PPS3</td>
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<td>STB3</td>
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**Note.** CMC1 = Composite Mood Checklist at time 1; CMC2 = Composite Mood Checklist at time 1; PANAS-P = Positive Affect and Negative Affect Schedule - positive scale; PANAS-N = Positive Affect and Negative Affect Schedule - negative scale; SES1 = Self-Efficacy Scale - item 1; SES2 = Self-Efficacy Scale - item 2; ML4 = Multi-Limb Test; RC1 = Rate Control Test; RO2 = Response Orientation Test; CP1 = Control Precision Test; PPS1 = Perceived Performance Scale - item 2; PPS3 = Perceived Performance Scale - item 3; PPS4 = Perceived Performance Scale - item 4; PPS5 = Perceived Performance Scale - item 5; PPSX = Perceived Performance Scale - mean of all items; LOC1 = Locus Of Control - item 1; LOC2 = Locus Of Control - item 2; LOC3 = Locus Of Control - item 3; CTL1 = Controllability - item 1; CTL2 = Controllability - item 2; CTL3 = Controllability - item 3; STB1 = Stability - item 1; STB2 = Stability - item 2; STB3 = Stability - item 3.
Table 7

Intercorrelations for Variables Tested in Mood and Performance Model

<table>
<thead>
<tr>
<th>Measure</th>
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<td>-.23</td>
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<td>9. PPS2</td>
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<td>.72</td>
<td>.69</td>
<td>.52</td>
<td>.72</td>
<td></td>
</tr>
</tbody>
</table>

Note: Mood = dummy coded variable (0 = negative, 1 = positive); SES1 = Self-Efficacy Scale - item 1; SES2 = Self-Efficacy Scale - item 2; ML4 = Multi-Limb Test; RC1 = Rate Control Test; RO2 = Response Orientation test; CP1 = Control Precision test; PPS1 = Perceived Performance Scale - item 1; PPS2 = Perceived Performance Scale - item 2; PPS3 = Perceived Performance Scale - item 3; PPS4 = Perceived Performance Scale - item 4; PPS5 = Perceived Performance Scale - item 5. Coefficients in boldface are significant at the .05 level.
Table 8

Fit Indices for Mood and Performance Models

<table>
<thead>
<tr>
<th>Mood Model</th>
<th>$\chi^2$</th>
<th>GFI</th>
<th>AGFI</th>
<th>RMSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood</td>
<td>173.32 (52df)</td>
<td>.92</td>
<td>.87</td>
<td>.15</td>
</tr>
<tr>
<td>Mood(comp)</td>
<td>173.22 (52df)</td>
<td>.92</td>
<td>.87</td>
<td>.15</td>
</tr>
<tr>
<td>CMC2</td>
<td>183.44 (51df)</td>
<td>.91</td>
<td>.87</td>
<td>.15</td>
</tr>
<tr>
<td>CMC2 (satur)</td>
<td>88.57 (13df)</td>
<td>.96</td>
<td>.74</td>
<td>.09</td>
</tr>
</tbody>
</table>

*Note.* Mood(comp) = competing mood and performance model; CMC2 = mood and performance model with composite mood checklist serving as mood variable; CMC2 (satur) = saturated mood and performance model with composite mood checklist serving as mood variable.
Table 9

Intercorrelations for CMC(time 1), CMC(time 2), Self-Efficacy, Performance, and Perceived Performance Variables

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>10</th>
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<th>12</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. CMC1</td>
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Note: CMC1 = Composite Mood Checklist - time 1; CMC2 = time 2; SES1 = Self-Efficacy Scale - item 1; SES2 = Self-Efficacy Scale - item 2; ML4 = Multi-Limb Test; RC1 = Rate Control Test; RO2 = Response Orientation test; CP1 = Control Precision test; PPS1 = Perceived Performance Scale - item 1; PPS2 = Perceived Performance Scale - item 2; PPS3 = Perceived Performance Scale - item 3; PPS4 = Perceived Performance Scale - item 4; PPS5 = Perceived Performance Scale - item 5. Coefficients in boldface are significant at the .05 level.
Table 10

Intercorrelation Matrices for Mood, CMC (time 2) and Attribution Variables, Grouped by Perceived Performance

Low Perceived Performance

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Table 11

**Fit Indices for the Mood and Attributions Models**

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*Note. Mood = dummy coded variable (0 = negative mood, 1 = positive mood), CMC2 = Composite Mood Checklist at time 2, LPP = Low Perceived Performance group, HPP = High Perceived Performance group.*
VITA

DATE OF BIRTH  
September 21, 1967

EDUCATION

1993 - present  
Ph.D., Industrial/Organizational Psychology  
Virginia Polytechnic Institute and State University, Blacksburg, VA  
Expected to graduate May, 1996

1990 - 1993  
M.A., Experimental Psychology  
New Mexico State University, Las Cruces, NM

1985 - 1989  
B.A., Psychology  
University of Missouri, Columbia, MO

PROFESSIONAL AND RESEARCH EXPERIENCE

6/94 - Present  
Virginia Polytechnic Institute and State University,  
Industrial and Systems Engineering, Blacksburg, VA  
Senior Research Assistant  
- Currently leading a project that entails a task analysis and  
  performance assessment of Tactical Action Officers aboard U.S. Navy  
  Ships  
- Gather and analyze classified data  
- Authored technical reports concerning the performance  
  assessment and task analysis of Naval Electronic Warfare Operators.  
- Developed and tested speech recognition systems to be used aboard  
  U.S. Navy Ships.

9/95 - 1/96  
American University  
Statistics Consultant  
- Analyzed data for graduate student’s thesis  
- Instructed student on statistics  
- Prepared student for thesis defense

6/95 - 8/95  
Brooks Air Force Base  
Human Resources and Manpower Division, San Antonio, TX  
Research Associate  
- Completed a study addressing the effects of mood on performance  
  on selection tests  
- Dissertation is an extension of this study
2/94 - 5/94  Neil M. A. Hauenstein, Blacksburg, VA
Consultant
• Conducted a job analysis for seven different positions using
observation and structured interview techniques.
• Wrote job descriptions for each position.

12/92 - 7/93  Army Research Institute, Fort Bliss, TX
Research Fellow
• Conducted a literature review on cognitive complexity and
leadership.
• Conducted a study looking at the relationship between cognitive
complexity, mental models, and problem solving.

8/91 - 12/92  New Mexico State University, Department of Psychology, Las
Cruces, NM
Research Assistant
• Gathered and analyzed data from a learning skills experiment
• Developed stimuli for an authoritarianism/minority influence
experiment.

TEACHING EXPERIENCE

Teaching Assistant, Virginia Polytechnic and State University

8/93 - 5/94  Industrial/Organizational Psychology
8/93 - 12/93  Psychometrics
1/91 - 5/91  Social Psychology
1/91 - 5/91  Personality Psychology
8/91 - 12/92  Introductory Psychology
8/90 - 12/90  Introductory Psychology

PUBLICATIONS AND PRESENTATIONS

the Air Force Office of Scientific Research.

performance appraisal. Poster presented at the annual convention of the Society for Industrial and
Organizational Psychology, Orlando, FL.

TECHNICAL REPORTS

Institute and State University, Displays and Controls Laboratory.

Beaton, R. J., Dallam, T. L., Deighan, J., Green, C. A., Medapati, S., O'Shea, J., G., Snow, M.
(1994). Shipboard Assessment of Required Proficiency (SHARP): Validation of Proficiency Assessment
Institute and State University, Displays and Controls Laboratory.
COMPUTER SKILLS

SPSS and SPSS for Windows programming
SAS and PCSAS programming
Microsoft Word, Excel, and Powerpoint

PROFESSIONAL MEMBERSHIPS

American Psychological Association
Society for Industrial and Organizational Psychology

ADDITIONAL PROFESSIONAL ACTIVITIES

1993 Annual Graduate Research Symposium
1992 Treasurer/Secretary for the Graduate Student Organization