THE EFFECTS OF REDUCED CHALLENGE AT THE CONCLUSION OF COGNITIVE AND EXERCISE TASKS

DISSERTATION

Presented to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Nancy S. Diehl, B.S., M.S.

Denton, Texas

August, 1998

Research has suggested that memories for difficult or painful experiences seem related to a combination of the worst and most recent moments. This peak-end theory was tested in relation to an exercise task (eccentric quadriceps using a BIODEX machine) as well as a cognitive task (standardized quantitative test questions). For each type of task there were two trials: short and happy endings. The happy endings trial included the same task as the short trial with an additional 25% duration at a lesser intensity (80% of short task intensity). A 2 (task type) by 2 (trial type) repeated measures design was used. Participants made global ratings of difficulty immediately after each component, thus generating four ratings, and later indicated their preferences for hypothetical future trials. Results indicated support for the theory that the shorter trials are evaluated as more difficult, with the cognitive task being evaluated as more difficult overall than the exercise task. Preference scores, however, revealed a preference only for the happy endings cognitive task, with no preference indicated on the exercise task. Results confirm previous research in suggesting differences between judgements of tasks and future choices. However, confounds complicated interpretations, especially for the cognitive task. The most conservative interpretation of data suggests that in circumstances where “more is better,” happy endings will result in more work with no higher level of discomfort. Implications for future research and applications of the theory are discussed.
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CHAPTER 1

INTRODUCTION

To be, or not to be, that is the question:
Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune,
Or to take arms against a sea of troubles
And by opposing, end them.
—Shakespeare, Hamlet

Types of Utility and Models of Evaluation

Although psychologists commonly refer to Shakespeare, they typically write of Lady Macbeth. Those studying Obsessive-Compulsive Disorder use her hand washing as the quintessential example of compulsive behavior as Hamlet’s indecisiveness may be correspondingly appropriate to decision making theorists. Early rational decision making theories suggested that individuals should make choices that are based on the expected usefulness or utility of a decision. Defining utility was based on the obvious consequences of observable events. Bernoulli (1738/1968) and Bentham (1823/1968) considered usefulness to be related to the subjective experience or hedonic value of a choice. For each individual, the perceived utility may be different depending on both individual characteristics as well as specifics of the circumstances or setting. For example, the benefit of more food does not increase linearly. The usefulness of the first loaf of bread to a hungry person is heavily valued. The jump from having no bread at all to one loaf of bread is much greater than the jump from having 99 to 100 loaves. This
value is referred to as experience utility in the professional literature, and relates to the hedonic value of the incident or item (Kahneman & Snell, 1990). The curvilinear nature of this relationship can also be found in the realm of financial wealth, where subjective understanding of usefulness is related to the needs and values of each individual at any given moment in time. Decision utility has been coined as the decision making term related to having a greater focus on consequences or outcome, thus having somewhat of a futuristic component (Kahneman & Snell, 1990). The different terms were created, in part, as a consideration that different foci may ultimately lead to different choices (McMullen, 1997).

In terms of decision making, outcome is often measured as the chosen course of action. Although people would often consider the choice and judgement as intricately related, there are distinct differences between the two. Judgements have more of a hedonic component related to preference, akin to experience utility. Alternatively, choice may be determined based on legality, morality and anticipated outcome. Shakespeare’s Hamlet went on to reflect that “Thus conscience does make cowards of us all.” Predicted utility, the final type of utility described, is defined as "the decision maker's anticipation of the experience utility of outcomes" (Kahneman & Snell, 1990, p. 296). Choice tends to be more related to cognitive weighing and searching for arguments to justify choices with a futuristic focus. Indeed, Tversky and Griffin (1991) found that payoffs were more important in choice than in judgment tasks when considering a theoretical job and salary. When this theory was tested in a more true-to-life laboratory setting, the results were also the same. Payoffs were more important for choice than for judgement.
Early rational decision theory did not consider conflict as having any bearing on decision making. However, recent research has indicated that conflict (consideration of advantages and disadvantages) makes choice aversive and delays the decision making process (Tversky & Shafir, 1992). Much of the time, individuals may not have well-established stable values or preferences, and actual values are constructed during their elicitation (Shafir, Simonson, & Tversky, 1993). Rationalist theory suggests that ideas of truths regarding the world are not simply experienced by the senses, but are also processes of the mind which includes such steps as deduction, analysis and emphasis on the reasons for behavior (Hergenhahn, 1997). Research focus has also centered on comparing how people actually choose and how they "should" choose based on a rational model (Einhorn, 1982). This model suggests that, even with differing perspectives, there is only one appropriate choice that should remain consistent despite potential changes in the frame of reference (Tversky & Kahneman, 1981). In fields such as economics and management, there continues to be attention to a formal modeling approach which associates a numerical value with each option and defines choice as a simple addition problem of selecting the option that maximizes value (Shafir et al., 1993). Again, the critical issues are related to defining the term value in the context of its setting. Unfortunately though, these relatively simple models are not always applicable to real world complex decision making processes. The implication is that people are rational beings who know and do what is good for them in the long run.

Individual Differences and Constructivist Theory
Part of the difficulty in understanding people’s choices may be related to the individual differences in preferences and styles (Kasimatis & Wells, 1995; Lamiell, 1987). The literature considering the forming of decisions is based firmly within cognitive rational theory and suggests that there are correct and incorrect ways of viewing the world and/or interpreting events. However, as the cognitive sciences have developed, there have been developments away from considering the brain as a mechanism to register the exact processes and information provided by the external world (Mahoney, 1987, 1995). Constructivist theory may provide a clearer framework to conceptualize some of the counterintuitive outcomes regarding decision making both predictive and retrospective (Kasimatis & Wells, 1995).

Constructivism has often been labeled as cognitive. One of the aims of individuals, the theory describes, is to reduce uncertainty and in so doing each individual acts as a scientist (Hergenhahn, 1997). Kelly (1966) stressed the multiplicity of theoretical contexts in which constructivism has been placed. Kelly noted that his theory has been classified as fitting those of learning theorists, cognitive psychologists, existentialists, behaviorists and Zen Buddhists, which speaks of the multiplicity of ways to interpret his theory. Constructivism suggests that individuals are both proactive and interactive participants in their own ongoing experiences in the world. From these experiences and the understanding of them, individuals predict future events based on their own unique framework or set of constructs (Mahoney, 1995c). The theory emphasizes individual freedom and contends that our understanding of the world is filtered through our own experiences rather than being based on “true” representations of
the world. Thus, there is a decreased emphasis on “right” and “wrong.” Constructivist theory suggests that individuals construct relatively flexible systems to predict future experiences.

Often there is uncertainty in decision making about the outcomes or even the relative importance of various components. Making a decision is additionally complicated because actual outcome(s) often do not always occur immediately after a decision is made, outcomes are difficult to predict, and they may not have a clear causal link. Predicted utility is based on the decision-maker’s beliefs or constructs related to the predicted usefulness of a possible consequence. Anticipated usefulness is both subjective and non-linear. When combining these characteristics with predicting observable events, these researchers empirically determined what had been only stated previously (e.g., Fischhoff, 1982) that studying the prediction of future tastes is extremely difficult!

Retrospective evaluations of options are also remarkably complex. The study of counterfactual thinking or “what might have been” has been studied fairly extensively in the last two decades (Roese, 1997). Counterfactuals are mental representations of past experiences considered in an “if only” approach. They can be manipulated by various comparisons eliciting different emotional responses based on the direction of the comparison, and on the perceived closeness of achieving the stated goal. Although the outcome of missing an airplane is the same in both circumstances, more frustration is indicated when the flight is missed by 2 minutes rather than by 2 hours (Kahneman & Tversky, 1982). Closeness in goal proximity has also been considered in the context of outcome such that Olympians reported more delight with their successes when receiving
a bronze rather than a silver medal (Medvec, Madey, & Gilovich, 1995). The suggestion was that silver medallists would perceive themselves as having just missed the gold, but bronze medallists would perceive themselves as having just missed no medal at all.

Counterfactual thought patterns or processes appear to be elicited most frequently in the context of unusual or unexpected behavior (Kahneman & Miller, 1986). Such behavior make take the form of using a different golf swing or taking an alternate route from work, then encountering an negative outcome which then triggers an “if only…” cognitive process. In general, counterfactual thinking may help to identify causal relationships, thus facilitating future performance (Roese, 1997).

**Heuristics and Decision Conflict**

People deliberate in complex ways, and emotional and social factors play important roles in this process (Kahneman, 1991). Sometimes decision-making processes are carefully thought out, but other times they are almost instinctual. Individuals are required to make a plethora of decisions on a moment-to-moment basis. Should I use black pen? How will I respond to this caller? Using conscious rational decision making techniques for each minor decision would impede the ability to accomplish. Heuristics are efficient, time and energy saving information processing short cuts (Myers, 1995). Heuristics help to increase the speed of making relatively simple decisions. However, sometimes time saving results in a decrease in accuracy. There has been continued emphasis in decision making focused on examining a variety of heuristics and the errors which sometimes result (Einhorn, 1982; Tversky & Kahneman, 1983). When confronted
with complexity, people use heuristic principles to help reduce the complex tasks to simpler ones (Tversky & Kahneman, 1974).

One of the most commonly researched and used examples of heuristics is that of representativeness. The rule is as follows: the more similar an individual (or object) is to a group, the more likely s/he is to belong to that group. Heuristics are commonly used to characterize vocations and are sometimes examined by presenting a description of an individual followed by questions asking about his/her occupation. For example, Tversky and Kahneman (1974) used the following description "Steve is very shy and withdrawn, invariably helpful, but with little interest in people or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail." (p. 1124). Participants were then given a choice of possible occupations for Steve. Most frequently, they believed Steve was a librarian, apparently based on how similar Steve was to the stereotype of this occupation. However, base rates refer to the overall rate of a given characteristic in the general population. In relation to this example, the base rate of librarians is much lower than many other occupations. Even with specific information about base rates, participants apparently ignored that information when making their choices, thus demonstrating the strength of the representativeness heuristic. People did not consider how these heuristics or decisional short cuts might not always lead to accurate information and thus decisions.

Another common heuristic is to misinterpret regression to the mean. Typically after a particularly good or poor performance, individuals tend to re-adjust to their usual level of performance. Individuals have a typical range of functioning. This is often
referred to as the "true level" in intelligence testing, "set point" in body weight, or "natural ability" in physical activities. This is not to suggest that performance can or does not vary outside this range, but there is a high likelihood that the typical range of functioning falls within these limits. Sometimes, regression to the mean has been construed as the curse of being on the cover of "Sports Illustrated." People are placed on the cover for a particularly outstanding performance, which regression to the mean would suggest that a less good appearance would be anticipated for the next time.

Misinterpreting regression to the mean can lead to serious problems both inferentially and practically. If someone performs unusually poorly, and undergoes a punishment, s/he will often do better the next time. The punishment is construed as effective and thus is more likely to be used in the future. The causal attribution for the change in performance is made to the punishment rather than to regression to the mean. Without any intervention that person would have been likely to regress to the mean, and would have performed better the next time. These erroneous conclusions clearly can be dangerous (Tversky & Kahneman, 1974).

There are other situations in which people make decisions or interpret events based on what has been termed the availability heuristic (Kahneman & Tversky, 1982). This shortcut is related to how easily individuals can think of an occurrence of a specific event. These biases are often based on the degrees of salience as well as familiarity. For example, the name Ryan may seem unfamiliar and infrequent until that is the name of a nephew. As it is now the name of a family member, it becomes more salient, and is remembered more frequently, even though the actual incidence is unchanged. Again,
using the example, individuals start noticing "Ryans" everywhere. People, then, misjudge the frequency of an event based on the availability of that event in their set of experiences, taking notice whereas they may otherwise not have coded this information.

In addition to using heuristics or decision making rules, it has been suggested that during decision making, conflict actually results in decision makers' constructing reasons to resolve conflict and justify their choices (Shafir, Simonson, & Tversky, 1993). These heuristics are often applied in decisions under conditions either of uncertainty of outcome, or of implications. Many decisions lack a clear certain outcome. Grave decisions are often made without outcome data readily available. Research has suggested that individuals making medical decisions can be influenced by the presentation of the data (Eraker & Sox, 1981; McNeil, Pauker, Sox, & Tversky, 1982; Redelmeier, Rozin, & Kahneman, 1993). If one chooses to participate in the chemotherapy, will it successfully kill the cancer? Doctors may present data as either the percentage of individuals who are helped or harmed, which result in different choices. If there is an option to choose between 10 or 12 treatments with 12 having increased likelihood of success (but more negative consequences), which is the better choice? The chemotherapy will probably become more and more unpleasant, with increasing side effects. Prediction tasks appear to sensitize people to subtle changes or trends in their experience and result in neglect of the overall effects relative to the effects of the changes (Kahneman & Snell, 1990). One might choose a "random" program on a stairclimber. As each new 30 second cycle appeared, attention would be focused on how difficult the current segment was compared to previous segments. The anticipation of what is coming and its relative difficulty
becomes more salient than the overall effect, thus sensitizing individuals to changes in the trends of their experiences.

In decision making theory, it has been often noted that losses are given more importance and weight than are gains (Kahneman, Knetsch & Thaler, 1991; Kahneman & Tversky, 1979, 1984). Part of this process is related to the what has been termed the endowment effect, that people demand more to give up an object than they would be willing to pay to acquire it (Thaler, 1980). Of note, Kahneman et al. reported that a loss of $10 results in more distress than the delight incurred by a gain of $10. Although most people choose to avoid aversive experiences or difficult situations (such as losses), there are times when they are unavoidable. Indeed, some kinds of physical pain (e.g., aerobic or muscle fatigue) are often even beneficial in the long run.

**Benefits of Exercise**

Many people perceive exercise as being a difficult or hard process (Myers & Roth, 1997). Exercise training, however, has been shown to have multiple long term benefits both physically and psychologically, including decreased risk for cardiovascular disease and osteoporosis, lowered blood pressure and cholesterol, as well as an increased a sense of well-being (e.g., Barinaga, 1997; Marcus, Bock, Pinto, & Clark, 1996). Individuals may make decisions regarding preferences with short term rather than long term consequences in mind. Despite increased knowledge of and awareness about these benefits, more than 60% of U.S. adults do not exercise regularly, and 25% remain inactive (U.S. Department of Health and Human Services, 1996). Recent research has suggested an individualized model of considering benefits and barriers to exercise (Myers
& Roth, 1997). In addition, general external forces such as societal pressures have been found to put pressure on individuals to appear fit (Diehl, Johnson, Petrie, & Rogers, in press; Nemeroff, Stein, Diehl, & Smilack, 1994). Additionally, social physique anxiety, or the anxiety people feel when they believe their bodies are being evaluated by others, has been implicated as a potential reason that people do not begin to exercise (Diehl, 1995; Hart, Leary & Rejeski, 1989). Of people who overcome the barriers to begin exercising, approximately 50% drop out within the first three months (Dishman, 1982). Even those with immediate and salient reminders of benefits, such as people recovering from surgery or an injury, exhibit less than optimal compliance with their physical therapy regimen. Perhaps exercise is construed as being difficult or painful. Oftentimes, individuals remember experiences as more painful than they reported during the actual experience (Rachman & Eyrl, 1989). It is possible that if the exercise experience were perceived as less painful or less difficult, there might be an increase in the likelihood of doing the activity again. Adherence to the recommended physical therapy protocol has been noted as critical to lasting improvement and thus increasing such behavior is crucial (Davidson, 1993).

How do people form evaluations of past episodes such as exercise? First of all, retrospective evaluations are less credible than are those of current experiences (Brewer, Van Raalte, Linder, & Van Raalte, 1991; Thomas & Diener, 1990; Varey & Kahneman, 1992). There are a number of competing theories including an averaging model, weighted averaging, and weighted averaging with a "peak & end" rule. All of these theories discount the importance of time spent at the task or number of repetitions performed,
unless an individual's attention is specifically focused on these variables. Averaging simply involves a conceptual additive model such that the perception of each additional task is equal to the perception of the last one. For example, if one were to receive eight needle injections, the seventh one would incur as much pain as the first. Using this model, the duration has no effect on the intensity of their overall experience. The second such model, a weighted averaging model, suggests that certain moments may be given more weight or value than others. Researchers have found that global evaluations are influenced by the change in the value of specific instances of aversive experiences rather than the overall effect (Hsee, Abelson, & Salovey, 1991). Fredrickson and Kahneman (1993) introduced the parallel between memory for affective experiences and snapshots, suggesting that events are remembered as a series of snapshots rather than as an ongoing cumulative film. That is, the time the "snapshot" is taken has more weight than other moments. Snapshots seem to be taken during particularly salient moments. In considering aversive experiences, Varey and Kahneman (1992) found that weighted averaging explained their data much better than did strict averaging. Specifically, they found that people give more weight to pain ratings at the end of a series, while also considering the pain at its worst. In fact, unweighted peak and terminal discomfort accounted for 94% of the variance in global evaluations of discomfort (Varey & Kahneman, 1992).

This theory would appear to have important implications if taken a step further. Would the addition of an episode of lesser intensity to a demanding task possibly lessen the global evaluation of the task's difficulty? Even if the overall difficulty level of a task remains constant, progressively more strenuous tasks are judged as more difficult than
progressively easier ones (Varey & Kahneman, 1992). Thus adding more work onto a sequence (at a lesser intensity) might actually result in a lower global evaluation of the difficulty of a task. This appears to be related to what has been termed "a preference for happy endings" (Ross & Simonson, 1991, p. 280). Given the occurrence of two events, participants preferred the scenario in which the positive event occurred last.

This happy ending preference also occurred in a study in which people were exposed to a cold water task (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). Participants were exposed to two trials of an aversive cold water task. The short task consisted of putting a hand in 14 degree Celsius water for 60 seconds. The longer task consisted of 14 degree Celsius water for 60 seconds with an additional 30 seconds at 15 degrees Celsius. After completing both tasks, participants were offered the choice of which trial to repeat. Of the participants, 69% preferred the long trial, suggesting that the overall experience is improved for them by the addition of more overall pain. These results add further support to the peak and end theory of memories for aversive situations. It is important to note that in this study the warmer water was noticeably warmer, but was still very cold. This suggests that even a slightly "easier" or "happier" ending can have an important impact on the way that task will be coded. Subjects' neglect of duration was not because they were unaware. When asked, the vast majority of participants were able to identify which trial was longer. Time then, simply seems to be less salient than the intensity and trends of these experiences (Fredrickson & Kahneman, 1993; Varey & Kahneman, 1992).
The generalizability of the peak and end pattern is of interest in a number of different domains. As noted earlier, the dropout rate of exercise programs is extremely high, and physical therapists sometimes struggle with clients about compliance issues. Research is currently underway to apply the happy endings concept to aerobic exercise activities. Preliminary reports suggest the same effect can also be found in aerobic exercise (Brewer, Manos, McDevitt, Van Raalte, & Holmes, 1997). Might these results be generalizable to muscle strengthening exercise? Does this peak and end theory apply to difficult cognitive tasks as well? Might a test be more likely to be repeated or considered less aversive if there were slightly easier questions at the end? Even if there were no preferences at all, it might be important to enhance the amount of work, cognitive or physical, being completed with no subjective change in the assessment of the experience.

Simulation Experiment

The current investigation addresses these questions which have also recently been considered in terms of a pencil and paper task (Diehl, 1996). Undergraduate students were given constructed data "from a previous study" regarding other peoples' experiences of subjective discomfort. Some participants were asked to rate an exercise (weightlifting-quadriceps) task (N = 119) and others rated a cognitive task (test taking) (N = 77). The short exercise trial's description stated that people had previously completed a total of nine repetitions. The earlier participants had made exertion ratings based on a 1 to 20 scale with lower numbers reflecting less exertion. Ratings were made every 3 repetitions resulting in ratings of 8, 13, and 17. The happy endings condition described people as
having completed 12 repetitions, with ratings after every three repetitions of 8, 13, 17, 11, respectively. The cognitive task used the same methodology except that, instead of repetitions, the manipulation was in terms of 5-minute time intervals. Descriptions stated that the exertion ratings were taken at 5, 10, 15, and 20 minutes. Thus, for both the cognitive and exercise tasks the happy ending condition involved the same amount of exertion, and then some. Participants in the study evaluated each of eight separate experiences, which included the short and happy endings conditions. Results did not differ based on the order these trials were presented, indicating no difference in preference if the happy endings trial was presented before or after the short trial. Evaluations were made on a 1 to 100 rating scale of the difficulty of the overall experience for the participant. Thus, the focus was on the experienced rather than predicted utility. Most of the participants, 78% exercise and 77% cognitive, rated the task as easier in the happy ending condition. In fact, the tasks were equivalent for the majority of the task, the preferred option simply had an additional 3 repetitions (or 5 minutes) rated at 11.

Current Investigation

It was hypothesized that these same effects which have been found related to a cold water task and an aerobic exercise task would also occur in the contexts of exercise and cognitive effort. The results from the simulation experiment suggest that, if generalizable, a laboratory investigation would result in a preference for the longer trial with the happy ending. It was hypothesized that participants would report similar or lower levels of overall discomfort from completing the longer trial and a relationship was
expected to exist between evaluations immediately after the trial and preference for the future. Participants were expected to have little difficulty judging the length of the task especially in the exercise arena, because the number of repetitions of the exercise task may be salient. Even without instructions to keep track of the number of repetitions, it was expected that many participants would be aware of the approximate number of repetitions for each trial. For the cognitive task, it was hypothesized that participants might have some difficulty judging which trial was longer because items were not numbered and this task was of a longer duration. However, the number of pages for the two trials was different, and may have been a fairly salient cue.
CHAPTER 2

METHOD

Participants

Participants consisted of 81 psychology students (38 men, 43 women) from a large Southern university. As part of the informed consent (see Appendix A), each potential study participant completed a Physical Activity Readiness Questionnaire (PAR-Q, Appendix B). No participants were excluded from the study based on the PAR-Q screening guidelines. The mean age was 21.66 (SD = 3.64) years and the ethnicity of participants was fairly representative of the overall university population with approximately 65% identifying themselves as Caucasian, 15% as African American, 7% as Hispanic, and 2.5% as Native American. Five percent did not provide information about their ethnicity, and approximately 5% commented that they did not fit the aforementioned categories. Approximately half the sample reported engaging in “vigorous aerobic exercise on a regular basis” (typically 2-4 days per week) whereas only 38% reported participating in strength training exercise on a regular basis.

Apparatus and Instruments

BIODEX. The exercise task was conducted on a single chair BIODEX Multi-Joint System-2 rehabilitation dynamometer with knee attachment, associated with BIODEX Advantage Software (BIODEX Medical Systems, Shirley, New York). The BIODEX was appropriate for this task because it allows for an individual strength test, involves the
ability to limit range of motion, and allows for the maximum force to be safely applied throughout the entire range of motion, unlike traditional free weights (Pollock, Wilmore, & Fox, 1984). The knee is one of the most commonly injured joints and the most commonly rehabilitated joint using BIODEX (BIODEX Medical Systems, Shirley, NY, 1991). Research has supported the use of the BIODEX equipment as effective in rehabilitating knee injuries (Maletius, Gillquist, & Messner, 1994; Levitt, Malinin, Posada, & Michalow, 1994). Because of the typical use, design, and frequency of knee injuries, the BIODEX was seen as appropriate for use in the current research.

CTP-III. The cognitive task consisted of a selection of quantitative questions taken from the Educational Records Bureau's (ERB) Comprehensive Testing Program (CTP-III; ERB, 1992). Permission to use these copyrighted materials was granted by the President of ERB, Otty Norwood, Ph.D. on September 16, 1996. ERB is a subdivision of the Educational Testing Service in Princeton, New Jersey, and has been conducting test development, norming, and scoring since 1927. They currently have over 1100 schools participating in their program. The CTP-III is a standardized test with multiple sections assessing verbal ability, vocabulary, reading comprehension, writing mechanics, writing process, mathematics, algebra, geometry, and quantitative ability. The mathematics and quantitative questions were designed using the National Council of Teachers of Mathematics standards, and each item was both content- and process-related. For the purpose of this study, quantitative questions were selected from level F (high school level) with easier questions selected from level E (8th grade level). These questions were expected to be challenging for most college students, but within their realm of experience
and expertise. Questions were not numbered, thus reducing the numerical cues about the length of the test. The quantitative section of level F is comprised of 50 questions, and ERB allows 35 minutes for completion. Every third question from level F was selected to create the two alternate forms of the test such that one form had questions 1, 4, 7, etc. and the other had questions 2, 5, 8, etc. One third of the test questions were not used in this investigation. To complete the happy endings condition’s cognitive task, 5 additional questions were added from the level E quantitative section (see Appendix C). Participants were given approximately 15 minutes to complete each of the tasks. Pilot testing resulted in completion of the cognitive tasks in between 10 and 14 minutes.

Impressions of Trials. Designed for the purpose of this investigation, the Impressions of Trials questionnaire consists of four questions relating to various considerations about task preference. Indication of preference for future behavior was considered to be one of the critical variables to measure during this study. Participants were asked to rate their choice of task on a 100 millimeter line, drawing a slash on the line to indicate the strength of their preference. Each of the four items was anchored by “first trial” or “second trial” to avoid any possible demand characteristics by giving names such as “short” or “happy endings.” Two different questionnaires of this nature were used in the study. One questionnaire was based on the two trials of the cognitive task, the other based on the exercise task. For example, one question asked about future task preference. “Suppose that we asked you to come back the day after tomorrow to repeat either the trial that you completed first, or the trial that you completed second. Which trial would you choose? Please indicate the strength of your preference by making
a slash at the appropriate place on the line. All the way on one end of the line would indicate a very strong preference, whereas a slash closer to the middle would indicate a moderate preference.” The other three questions were more focused on current experience rather than future expectations. These questions were related to which trial caused greater overall discomfort, which one was tougher to cope with, and which lasted longer (see Appendix D).

**Global Evaluation.** Designed for the purpose of this study, the Global Evaluation questionnaire was administered in two different forms. After completing the preliminary exercise trial, participants were asked the following question. “For the task you just completed, we would like you to provide a global evaluation of how enjoyable the overall experience was using a scale from 1 to 100, with 1 corresponding to ‘Not enjoyable at all’ and 100 corresponding to ‘extremely enjoyable.’” Immediately after each of the other trials (two exercise and two cognitive), participants completed a similar questionnaire. The only difference was in the wording, such that participants were asked how difficult the overall experience was for them. Thus, higher numbers corresponded to an increased perception of difficulty (see Appendix E).

**Positive and Negative Affect Schedule (PANAS).** The positive and negative affect schedule is a 20-item checklist designed to be completed quickly (Nemanick & Munz, 1994). Participants rate each adjective (e.g., interested, upset, enthusiastic) on a 5 point scale indicating “to what extent you feel this way right now, that is, at the present moment” with 1 indicating “very slightly or not at all” and 5 indicating a strong endorsement of the item, “extremely.” Scores on each scale are determined by summing
items on that scale thereby creating a range from 10 to 50 on each scale (see Appendix F). Two factors, positive and negative affect, are determined from the scale. Results from the design of the test indicate a low correlation between the two factors of -.15. Eight-week test-retest reliabilities for the sample of college undergraduates were .54 for the positive affect scale, and .45 for the negative affect scale. Since the administration directions asked about affect “at the present moment” it was expected that correlations would be somewhat variable. The initial investigators also found good external validity, citing PANAS scores in relation to the Hopkins Symptoms Checklist resulting in a correlation of .65 (Watson, Clark, & Tellegen, 1988). Results from this investigation indicated high internal consistency for both the positive and negative factors both with Cronbach’s alphas of .83.

Physical Activity Readiness Questionnaire (PAR-Q). The PAR-Q is a 6-item pre-exercise screening questionnaire designed to ensure that participants are physically able to participate in exercise without putting themselves at risk (Shephard, Thomas & Weller, 1991). Originally developed in 1975, items are yes/no with an “if yes, explain” request and questions are related to heart and chest pain, blood pressure, dizziness, joint problems with an additional option to address another physical reason related to not being able to participate in an exercise activity. The PAR-Q is simple to read and understand and can be completed quickly. Its sensitivity has been found to be perfect in a general sample of Canadians and specificity was 80%. Considering severe physical problems might be at stake, it is critically important to maximize sensitivity, allowing specificity to decrease
This scale and its revisions have been widely and successfully used over the 20 years since its original development (see Appendix B).

**Demographic data.** Participants provided demographic information, including age, gender, height, weight, and race/ethnicity. In addition, they were asked to identify their current level of exercise involvement in both aerobic and strength training realms. If they responded affirmatively to being involved in either type of exercise activity they were then asked to indicate how many times in a week they engaged in such behavior and for what duration per session (see Appendix G).

**Design and Procedure**

Participation in this experiment included involvement in two separate but conceptually related tasks. Since the overall purpose of the research was to test the generalizability of the "happy endings" theory, there were two different areas of assessment: a cognitive task and an exercise task. A repeated measures design was employed, with each subject participating in both trials (short and happy ending) of each task type (cognitive and exercise). After each of the four activities, participants responded to questionnaires about their overall perception of the task's difficulty (see Appendix D).

More specifically, the exercise task consisted of performing a maximal strength quadriceps eccentric contraction task followed by two workout trials (short and happy endings). The short trial was composed of 9 repetitions at approximately 70% the participant's maximum capacity. The happy ending trial consisted of 12 repetitions - the first 9 were the same as the short trial, followed by 3 additional repetitions at 80% of the short trial torque (56% of the original maximum torque). The cognitive task consisted of
participation on a written math test. The short trial had 17 math questions, which
typically took between 10 and 15 minutes to complete. The happy ending trial consisted
of 17 equivalently difficult math questions followed by 5 easier questions. Participants
completed the cognitive tasks between sets of the exercise task.

After determining a participant's eligibility based on medical forms and informed
consent, each person was read standardized instructions about the testing procedures. The
participant was then positioned and stabilized with seatback tilt at 15 degrees and hip
flexion at 85 degrees on the BIODEX. The knee attachment was adjusted so that the calf
pad placement was proximal to the malleoli and below the prominent calf musculature,
without impeding dorsiflexion of the ankle (BIODEX Medical Systems, Shirley, NY,
1991). Velcro straps were firmly attached to hold the calf pad in place, but not so firmly
as to cause discomfort. Stabilization was completed with the thigh, pelvic and shoulder
straps. The participant was then given the remote comfort stop button, so that s/he could
stop the machine at any time. Range of motion was set from 0 degrees extension to 90
degrees flexion, allowing for full range of motion, but preventing any hyperextension of
the knee. During the course of the experiment, the BIODEX was set to the passive mode
at a speed of 60 degrees per second. The amount of the force exerted by the participant
was variable, but the BIODEX passes through 60 degrees in one second. Torque limit for
direction 1 during the maximal test was set to "maximal." Torque for direction 2 was at
the minimum level, and participants' legs were lifted at the 60 degrees per second rate.
Thus, participants were involved in a quadriceps only task using eccentric contraction.
The participants were involved in a three-repetition maximal test after becoming familiar with using the equipment. To familiarize participants with the feel of the equipment, they completed 2 repetitions with directions to "just get the feel of the range of motion and the machine. Don't exert much energy this time, just get used to how things feel." Upon the participant's indication of understanding the equipment and stating readiness to begin, he or she completed three repetitions as a maximal test to determine individual eccentric torque (foot-lb). Participants then completed a Global Evaluations Questionnaire, undid the Velcro straps and moved to the desk to complete the cognitive task. While the participant was involved in the cognitive task, data were gathered from the computer so that the participant's physical resistance in foot-lb of torque could be calculated. These calculations were done to determine both the basic torque for the trials (70% of their maximal repetition) as well as the happy ending torque (80% of the basic lifting torque or 56% of their maximum). Upon completion of the cognitive task, participants were asked to complete the Global Evaluation Questionnaire (see Appendix E).

The participant then moved back to the BIODEX chair and was stabilized. Then the first trial of the exercise task began. Again, participants were counterbalanced in terms of completing the happy ending trial first or second. The regular trial consisted of nine repetitions at 70% of max. The happy ending trial consisted of nine repetitions at the same intensity (70% of max) followed by 3 additional repetitions at 80% of that torque. After getting off the equipment, each participant was again asked to complete the Global Evaluation Questionnaire followed by the second cognitive task (same format) and the
second exercise task (same format). Order of the workout trials (short or happy endings) and the cognitive trials was balanced using a Latin square design. Finally, each participant was asked to complete the Impressions of Trials Questionnaire for both the cognitive and exercise tasks (see Appendix D), followed by the PANAS (see Appendix F).
CHAPTER 3

RESULTS

Descriptive Statistics

In considering the responses on the two Impressions of Trials Questionnaires, it is interesting that range of preference scores for the short or happy endings trials encompassed the spectrum of possibilities from 1 to 100. The preferences were marked on a continuum. Numbers below the midpoint indicated a preference for the happy endings trial, and numbers above the midpoint indicated a preference for the short trial.

Means ranged from 37.31 to 41.05 on items such as indicating that the happy endings trial was longer, and that participants would choose to repeat the happy endings trial (cognitive task) if they were asked to make the determination again. The highest numerical value of a mean was 55.49 indicating which exercise trial would be chosen to repeat in the future (see Table 1).

In addition, participants made other evaluations of task and trial (Global Evaluation Questionnaire, see Appendix E). One of these questionnaires asked how enjoyable the task was for participants and was administered after the initial strength test. Participants’ response to this question indicated a moderate level of enjoyment with the modal response of 50.00 and a mean of 63.90. There was no correlation between responses to how enjoyable the strength test was and how difficult they reported exercise trials as having been for them, $r_{short} = .03$, $r_{happy endings} = .15$. 
These other Global Evaluations Questionnaires (task difficulty) occurred immediately after each trial of each task, resulting in four different evaluation scores for each individual. These evaluations also encompassed the maximal ranges. This scale, ranging from 1 (not at all difficult) to 100 (extremely difficult), was somewhat different than the preference score. On this item individuals were asked to rate “How difficult was the task you have just completed?” with the exercise evaluations on the happy endings and short trials respectively as 39.44 and 43.96. The evaluations of the cognitive task were rated as more difficult with means of 48.90 and 55.41 respectively (see Table 1).

The PANAS produced a positive mood score and a negative mood score. Participants endorsed having more positive than negative affect, with mean positive affect being 26.46 (SD = 7.40) on a 10 to 50 point scale. Negative affect had less variability and a lower mean (M = 13.14, SD = 4.29). The modal response for negative affect was 10 and more than half the participants scored less than 11, suggesting that many participants were not feeling jittery, guilty, hostile or upset at the end of their participation in the study (see Table 1).

Pilot data suggested that greater than 5 millimeters either side of the exact center was commonly agreed upon as an indication of a clear preference. Therefore those respondents who did not show a clear preference were not included in analyses related to preference. This criterion was considered separately for each of the four questions on the two (cognitive and exercise) Impressions of Trials Questionnaires. For each item on the questionnaires, most participants did indicate a clear preference (see Table 2).
Correlation Matrix

A large correlation matrix was generated indicating only a few correlations with a value of greater than $r = .40$. Individuals were relatively consistent in their evaluations of short and happy endings math trials, $r = .63$, $p < .01$, as well as their evaluations of exercise trials, $r = .70$, $p < .01$. There were also strong relationships between performance on the short and happy endings trials of each task with total work (exercise task) on each trial, $r = .94$, $p < .01$. Similarly, the relationship between the two kinds of trials on the cognitive task was $r = .51$, $p < .01$. Considering the strong correlations between performance on the two trials of a task and the relationship between the evaluations of the two trials, it would be expected that there would also be a relationship between performance on a task and the evaluation of that task. There was a slight relationship found for the cognitive task, $r = -.27$, $p < .05$ for the short math trial and $r = -.29$, $p < .05$ for the happy endings trial. There was no significant relationship between total work and evaluation of exercise trials.

Mood states were also considered in terms of the bipolar data given by responses on the PANAS. Because the PANAS was not used in a pre-post manner, it was important to ascertain if the order of trials had any effect on mood. As expected, one-way ANOVAs revealed no differences for the cognitive task on either positive or negative mood, $F (1,79) = .64$, $p > .05$; $F (1,79) = .81$, $p > .05$. In addition, there were no differences for the exercise task on positive or negative mood, $F (1,79) = .04$, $p > .05$; $F (1,79) = .69$, $p > .05$. Neither positive nor negative mood state was related to most of the variables in the
study. The positive mood factor was related to the amount of work done on the short trial of exercise, \( r = .25, p < .05 \), and inversely related to the happy endings cognitive task evaluation, \( r = - .23, p < .05 \). Negative mood was inversely related to actual cognitive performance on the happy endings math test. Positive and negative mood state were completely unrelated to each other. More specific data regarding relationships between continuous variables can be found in the correlation matrix (see Table 3).

**Difficulty Manipulations**

A critical determination before examining the results from further analyses requires consideration of the question, "Was the happy endings portion really easier?" In considering the difference between the difficult portion and happy ending portion of the cognitive task, an examination of the mean percentage correct on these items indicated the strength of the manipulation (\( M \) of hard = 0.62, \( SD = 0.17 \); \( M \) of happy endings = 0.92, \( SD = 0.15 \)). A t-test revealed that this difference was significant, suggesting that the happy endings portion of the trial was truly easier for participants \( t(79) = 13.95, p < .001 \).

In considering the data from the exercise condition, measures of work were used to determine if the manipulation was effective. Before conducting these analyses, it was important to determine if total work (in ft-lbs.) was affected by the order of the trials, since this would suggest that fatigue might have been a factor in work performance. Two t-tests indicated that there were no significant order effects for the happy endings trial \( t(80) = 0.53, p > 0.05 \), or the short trial \( t(80) = 0.30, p > 0.05 \). The data available from the BIODEX were total work, work in the first third of the set, and work in the last third of
the set. Since there were 9 repetitions in the short trial and 12 in the happy endings trial, the thirds represented different amounts in the two trials and could not simply be compared. The most parsimonious solution was to divide the value obtained work data by either three or four depending on the number of total repetitions involved.

To determine if fatigue played a factor, the first and last third of the short trial were compared. They were found to be different $t(80) = 2.75, p < .01$ with the difference in the direction of more work occurring in the first third, as might be expected as a result of fatigue. Therefore, it cannot be assumed that each repetition elicited the same amount of work. The main consideration for determining the effectiveness of the manipulation was to compare the last three repetitions of the happy endings condition with the last three repetitions of the short trial. However, since fatigue played a factor, it would be expected that less work would be accomplished on repetitions 10-12 than on repetitions 7-9. Therefore, some amount of work (a fatigue factor) needed to be subtracted from the short trials 7-9 to equate them with trials 10-12. An average amount of fatigue per three repetitions was calculated by finding the difference between work in the first and last third of the short trial, and dividing it by two to estimate fatigue for each three repetitions. This was then subtracted from the work on the last three repetitions of the short trial to obtain the fatigue adjusted work score.

The final step was to compare the last three repetitions of the short and happy endings trials. However, data available in considering the last third of the happy ending trial includes four repetitions rather than the three in the last third of the short trial. Of these four, three made up the happy endings portion. The mathematical requirement was
to subtract the “regular” trial from happy endings repetitions in an accurate, conservative manner. Because the first third of the short and happy endings trials were equivalent, it would be expected that repetitions 7-9 would also be equivalent. Therefore, the average of the final third of the short trial was subtracted from the last third (four repetitions) of the happy endings trial. Data from the happy endings portion of the happy endings trial were compared to the final third of the short trial. The calculated difference was in the predicted direction, $t(80) = 3.61, p < .001$, suggesting that the happy endings condition was, in fact, relatively “easier” at the end.

**Equivalence of the Hard Portion of Conditions**

**Cognitive task.** To consider the tests relative to each other, an adjusted score needed to be calculated to make the two trials equivalent in length. Thus, the happy endings adjusted score was based on the percentage of correct answers on the “hard” portion of the test. The happy endings test adjusted score is comparable in concept to the short test score. If the tests were equivalent as they were designed to be, these numbers should not be statistically different from each other. However, a repeated-measures $t$-test indicated a significant difference, $t(79) = 7.39, p < .001$, with participants having a higher average score on the difficult portion of the happy endings test. For those who did score differently on the math tests, their preferences were unrelated to their actual performance, $\chi^2(1) = 0.17, p > .05$. However, this confound complicates the interpretation of these data and thus mathematical solutions were sought to mitigate effects of this confound.
One way to consider the data outside of this confound was to examine scores of participants who did not score differently on the two tests and to examine their preferences. Scoring statistically comparably on the two tests was scoring within two correct (e.g., 10 correct on one test, 12 on the other) on different trials of the difficult portion of the trial. There were 35 (of the original 81) people who met the cognitive task performance comparability criterion. As with the other data analyses, the participants who indicated no clear preference were excluded from these analyses. This left 25 participants who scored equivalently on the test and did have a clear preference. Of these individuals, there was a strong preference for happy endings, \( \chi^2(1) = 6.76, p < .01 \).

Another way of mathematically attempting to correct for this confound was to consider the “correction factor,” or ideographic performance-adjusted preference score. This was calculated by considering the happy endings math adjusted percentage (not including the easy questions at the end) and dividing it by the short trial math percentage. This resulted in a separate correction score for each participant. The resulting correction factor was multiplied by the original preference score, to create an adjusted preference score based on actual math performance. The mean adjusted preference score was 48.95, which was statistically not different from the null hypothesis of 50, suggesting that even with this conservative estimate of preference, participants did not mind having the extra test items, \( t(79) = -0.27, p > .05 \). These data were also analyzed in the same manner as the overall sample, excluding the group with no clear preference. The same results were obtained as with the t-test; there was no difference between groups, \( \chi^2(1) = 0.47, p > .05 \).
Exercise task. To determine if individuals performed equivalent amounts of work on the first third of the two trials, their performance during these two intervals was compared. The difference between the values for the two trials was not statistically significant, \( t (80) = 0.90, p > .05 \). However, it was important to rule out the potential effects of trial order. A MANOVA was conducted to examine these effects. As anticipated, there were no differences between work output based on order of trials, \( F (1,79) = 0.09, p > .05 \); \( F (1,79) = 0.28, p > .05 \). There were no effects of order on either performance for the short trial, \( F (1,79) = 0.26, p > .05 \) or for the happy endings trial, \( F (1,79) = 0.26, p > .05 \). Finally, there were no differences in how participants evaluated each trial (immediately after) based on whether they participated in the short or happy endings trial first, \( F (1,79) = .13, p > .05 \); \( F (1,79) = .26, p > .05 \). Nor did order have any effect on preference for the exercise task for either the short or happy endings trial, \( \chi^2 (1) = 3.29, p > .05 \).

Main Analyses

As mentioned previously, individuals with no preference (50 ± 5) were removed from the sample. Groupings were made for the preferences with those who marked below 45 preferring happy endings, and those above 55 preferring the short trial. Results indicated that participants were able to identify that the happy endings trials were, in fact, longer on both the cognitive and the exercise tasks, \( \chi^2 (1) = 11.84, p < .01 \); \( \chi^2 (1) = 5.55, p < .05 \), respectively. On the cognitive task, results indicated that participants found the short cognitive trial to cause more discomfort, \( \chi^2 (1) = 6.78, p < .01 \), and to be more difficult to cope with \( \chi^2 (1) = 5.06, p < .05 \) than the happy endings trial. Their preference
for the happy ending cognitive task was further exemplified by their indication of preference when asked which task they would prefer to complete again at a later date, $\chi^2(1) = 7.00, p < .01$. There were no differences on the exercise task regarding which trial (short or happy endings) caused more discomfort or was tougher to cope with, $\chi^2(1) = 0.13, p > .05$; $\chi^2(1) = 0.14, p > .05$. Additionally, there was no difference on which exercise trial participants would choose to repeat in the future, $\chi^2(1) = 2.45, p > .05$. It was considered that task familiarity might be related to preference. The relationship between regular weight training activity and preference scores for the exercise task was, therefore, considered. Results, however, indicated no significant relationship between these two variables, $\chi^2(1) = .01, p > .05$.

The relationship of preferences to evaluation scores was also considered. It would be expected, for example, that the participants who preferred the happy endings task in the future would also have evaluated this same task as being less difficult. However, repeated measures MANOVAS revealed no differences between groups of people with different preferences on measures of happy endings evaluation scores for the cognitive task, $F(1, 60) = 0.86, p > .05$. Likewise, no differences were found for the exercise task evaluations for the short or happy endings trials, respectively, $F(1, 67) = 2.26, p > .05$; $F(1, 67) = 0.11, p > .05$. The expected relationship was found only on the short cognitive task, $F(1, 60) = 4.11, p < .05$, with those who chose the short trial to repeat in the future indicating the short trial was less difficult.

Because of the design of the preference score, a repeated-measures ANOVA could not be conducted with this variable because the preference score would have to go
into two different cells simultaneously, thus violating the assumptions of the statistic. However, evaluation scores taken immediately after task completion were appropriate as dependent variables for a repeated measures ANOVA. Results of this 2 (short or happy endings trial) X 2 (cognitive or exercise task) repeated measures ANOVA indicated no interactions, but two main effects. There was a main effect for trial length suggesting that the short trial was evaluated as being more difficult than the happy endings trial $F(1,79) = 8.61, p < .01$. There was a main effect for task type as well, suggesting that the cognitive task was considered to be more difficult than the exercise task, $F(1,79) = 12.01, p < .001$. 
CHAPTER 4

DISCUSSION

The most interesting finding from the current investigation is that individuals, given the opportunity, perceive the option that requires more time and greater overall effort as being less difficult. This anomaly has been called a preference for happy (or happier) endings and was previously investigated in the context of a cold water pain task (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993) as well as a pencil and paper simulation of exercise and cognitive activity (Diehl, 1996). Prior research has suggested that evaluations of difficult or painful tasks appear to be based on a combination of the worst and most recent moments. This line of inquiry suggests that adding more work, at lesser intensity, results in a decreased evaluation of overall difficulty. The current investigation considered this theory of evaluations and preferences in the context of two other dimensions of activity in a laboratory setting, those of cognitive and physical effort. When exposed to two different tasks and two different trials, it was expected that individuals would indicate a preference for the trial with the happier ending, with some level of awareness that the happy ending trial was, in fact, longer.

Results indicated that participants in the current investigation evaluated the happy endings trials as being less difficult than the short trials for both the cognitive and the exercise task. This evaluation was conducted immediately after each trial, and was not based on the order of the trials. Thus, this difficulty assessment was related more to the
judgement of the task itself, rather than having a focus on future choice. Researchers have noted that changing the focus of a question can elicit differing responses for indicated preferences (Tversky & Griffin, 1991). Results of the current investigation corroborate the hypothesis that there would be decreased discomfort with increased overall work, which was consistent with the paper and pencil simulation (Dichl, 1996). The longer trial with more overall work (happy endings) was evaluated as less difficult, which has important implications for a variety of different disciplines including education, physical therapy, and psychology.

The obtained results were slightly different when hypothetical future preferences (choices) rather than immediate evaluations (judgements) were considered. For the cognitive task, participants chose the happy endings trial more frequently, and evaluated happy endings trials as being less difficult than the short trials. For the exercise task, there was no difference in future preferences with approximately half of participants choosing the short task, and half choosing happy endings. Participants demonstrated the ability to accurately determine task length even when basic cues were removed, as was the case in the pain research (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). This finding adds more evidence to the suggestion that duration plays a surprisingly small role in evaluations of experiences (Fredrickson & Kahneman, 1993).

The major findings of the current research must be considered in light of the evidence bearing on its internal validity. For both the cognitive and exercise tasks, the happy endings portion of the task was, in fact, easier than the accompanying "short" part. Additionally, there were no effects on preference or evaluation based on which trial was
completed first. Nor were there differences between people who regularly participated in weight training exercise compared with those who did not. However, the cognitive task was not equivalently difficult on the two trials. Interpretation of the cognitive task is confounded by the fact that the happy endings trial was actually easier on the difficult portion. If the overall evaluation is based on both the worst moment of a situation, and the most recent moment, then both of these pieces would be considered easier relative to the short trial. Various statistical means were used to control for this confound. Approximately 45% of participants did not score differently on the two tests and these individuals indicated a clear preference for the happy endings trial. Additionally, a very conservative correction factor was used to attempt to equate the preference scores based on task performance, and this score resulted in no difference between the number who preferred the short or the happy endings trial. Perhaps with this adjusted score the present results on the cognitive tasks should be considered more as a willingness to tolerate happy endings (more overall work) than as a preference for happy endings.

Most individuals did indicate preferences on most tasks. This decision making may be related in part to a preference for control over future decisions (Bandura, 1986, 1997; Langer, 1975). Alternatively, it may be related to people's natural strivings, in the constructivist way of thinking, to anticipate future events (Hergenhahn, 1997). Although differences were found on the cognitive task, the aforementioned confound complicates the interpretation of these data. Analyses of the exercise task did not indicate a clear preference between short or happy endings trials. An alternative explanation for the lack of significant differences may be related to some aspects of the tasks themselves, the task
duration, or to the personality characteristics of individuals. Technically, the absence of significant differences does not necessarily indicate a lack of opinion regarding the two tasks. People may care whether they are going to participate in the short or happy endings trials, but their preferences may be bimodal. Personality characteristics as well as specific task characteristics could be investigated as part of the consideration of this alternative explanation. Here, as in other research (Lamiell, 1987), the importance of individual differences must be acknowledged.

It was expected that evaluations would be related to preferences. However, this was not the case in this investigation. For both tasks, those who chose the short trial did not evaluate the short or happy endings trial any differently than those participants who chose the happy endings trial. The only difference was among those who selected the short trial for the future. For them, preference was related to evaluation. Of the participants, this group was the smallest suggesting that some personality characteristic or individual difference may help to explain differences in behavior. As mentioned in the introduction, purely rational theories do not coincide well with individuals’ actual choices and decisions in these arenas. Instead, a better fit may be found within the context of constructivism, which describes a number of different possible interpretations of an event and suggests that individuals are proactive in interpreting their experiences (Mahoney, 1995b). It has been suggested, both within decision making theory and in other areas, that individuals are typically not aware of alternative frames and their possible effects on the relative attractiveness of options (Merikle, 1992; Tversky & Kahneman, 1981).
Additionally, there was a lack of an expected relationship between actual performance on each task and evaluation of the task. Research has suggested that people typically like tasks better if they perform well on them (Williams, 1994). It may be that because of the lack of concrete feedback in the study, individuals were relatively unaware of their own performance level. Research has indicated that metacognition is less accurate when performers are non-expert (Sinkavich, 1995). Participants were correct only about half of the time on the quantitative problems and the eccentric quadriceps contractions seemed to be relatively novel as well. The relationship between partiality and positive performance might be a result of having concrete information that an individual is, in fact, doing well.

These tasks were designed so that participants would be as unaware as possible of differences in task difficulty in the happy endings trial. Therefore there were no obvious cues as to numbers on the math questions or designations of a different section. Similarly, the experimenter and BIODEX computer were positioned so that a participant would not see the dials and gain a sense that the physical challenge had been changed. The indication to the participant that the trial was easier would come from their ability to limit the motion of the BIODEX. Data regarding exactly how many participants actually stopped the machine were not available. However, research assistants estimated that approximately 25% showed signs of awareness that the task became easier towards the end. Although this lack of knowing was done purposefully in this investigation, the implications are wide for future research in this area. Although tests are often designed by other people, typically without cues of difficulty level, exercise sessions are often
defined by the exerciser. There are, however, many exceptions. For example, particularly in youth sports, a coach typically designs team practices. But for the non-competitive athlete, such sessions (if available) provide much less structure. Thus, cognitive awareness and the role such awareness might play in the assessment of task difficulty and preferences are important areas to consider in future investigations. For some tasks, awareness may be a prerequisite to participation, while for other tasks cognitive awareness of differences may be neither necessary nor beneficial (Mahoney, 1995a; Pascual-Leone, Grafman, & Hallett, 1994).

It is also important to consider task length. In this laboratory study, the cognitive task was significantly longer in duration than the exercise task. Evaluation scores indicated that individuals found the cognitive task to be more difficult. It is unclear if the perception of increased difficulty is related to the type of effort required, the task length, or some combination of the two. The pain investigation of Kahneman and his colleagues used trial lengths of 60 to 90 seconds. The exercise task in the present investigation took approximately 40 seconds, while the cognitive task took approximately 12 minutes. The exercise task length was fairly representative of the typical length of one trial on an exercise machine. However, it may be that the importance of happy endings increases as the length of the trial increases. Thus, it may be more important within an exercise context to design an entire session with a happy ending rather than ensuring that each part of the workout have a happy ending.

Because this study did not incorporate a pre- and post- measure of mood, it was important to ascertain if the order of trials was related to scores on the mood measure.
For both the cognitive and exercise tasks order of trials had no impact on positive or negative mood states. In fact, mood states were related to very few variables, perhaps suggesting that this measure of mood is relatively stable and is not related to task order, performance, or evaluation. Positive mood was related inversely to the perceived difficulty of the happy endings cognitive task, suggesting that those who reported more positive affect rated the trial as being less difficult. Otherwise stated, if an individual is feeling good, the difficult tasks are not perceived as quite as aversive. Additionally, positive mood was related to the total work done on the short trial of the exercise task, suggesting that those with higher positive mood also did more work on the short trial of the exercise task. Finally, negative mood was inversely related to actual performance on the happy endings cognitive test, indicating that those who did well on the happy endings trial of the cognitive task also reported lower levels of negative mood state. In sum, those who did well on the happy endings cognitive task reported somewhat lower levels of negative mood. Additionally, participants reporting higher levels of positive mood indicated that the task was less difficult and those with less positive mood indicated that the task was more difficult.

**Limitations of the Current Research**

The most striking limitation of the study is the actual difficulty levels of the cognitive task. Despite care taken in the selection of items for these two trials, participants performed better on what was designed to be the “hard” portion of the happy endings task. Since they were instructed to complete the problems in order, this difference in performance cannot be related to perceptions of efficacy by having
effectively solved some of the easier problems (Bandura, 1997). Although results would have been more clear if this confound had not existed, the results were addressed statistically in two different ways. First, individuals who performed equivalently well on cognitive tests were considered separately from the rest of participants, and they indicated a preference for happy endings. Second, the use of a conservative correction factor for the entire sample based on actual test performance resulted in mean scores that indicated no preference for either trial. It seems clear that there was not a preference for the short trial.

For the exercise task, the BIODEX was set such that repetitions would be easier for the last 3 repetitions of the happy endings trial. Awareness of the change was expected to originate from participants’ increased abilities to stop the machine, then easing off their resistance a bit. However, many participants did not actually stop the machine. Therefore, most of them probably did not have a cognitive awareness that the repetitions at the end were easier. Based on the comparison of repetitions between trials, it does appear that work expenditure decreased more than would have been expected based on fatigue, but they may have never actually consciously recognized a difference.

The third limitation of the current investigation is related to the external validity of the study, specifically the population studied. Although these college students may have been a fairly accurate representation of others their age, they do not represent breadth of ages. Consideration of external validity suggests that results of the current investigation should not be generalized across age cohorts.
Directions for Future Research

In the future, it will be important to identify parameters of both the individual and/or the task to be considered as predictors of preference. One of the earliest considerations would be to replicate and extend the current research to corroborate observations. This bears strongly on the importance of concluding episodes of extreme physical or cognitive effort with brief periods of reduced effort. Most immediately it is important to refine the tasks so that there can be more of a definitive understanding of happy endings in the cognitive and exercise areas. Using equivalently difficult cognitive tasks (on the difficulty portion) and making certain the difficult and easier trials are noticeably different will be critical. This approach offers the ability to accurately manipulate task difficulty, thereby facilitating understanding of how difficult and how long the additional happy ending can be. There is still great controversy among exercise researchers about the amount of exercise required to gain health benefits (Barinaga, 1997). Some suggest that moderate exercise reduces risk factors, others believe that more intense exercise is necessary. However, consensus seems to be that more is better. With a goal to increase overall activity level in mind, it is clear that the possibilities of happy endings applied to this arena could potentially have a great impact. In the current research, overall trial evaluations indicated a sense of preference for happy endings on both cognitive and exercise measures.

The potential implications of individuals’ willingness to complete more total work (physical or cognitive) when somewhat easier material is added to the end has
important implications in other areas. For example, future research could consider the
treatment of phobias and/or anxiety using systematic desensitization with happy
endings. In using this treatment modality, clients typically participate in three basic
steps. First they are taught a response that competes with anxiety (e.g., relaxation).
Next the therapist and client construct an anxiety hierarchy. Finally the desensitization
itself includes an approach to the feared stimulus (often beginning in vivo) in a step-like
manner with progressively closer approximations to the feared stimulus (Wolpe, 1958).
It would be worth investigating the effects of spending more exposure time at a slightly
lower “step” at the end of each session. Other tasks that involve high levels of overall
activity should also be considered. Designing one’s day in terms of homework order,
housecleaning tasks, business activities or manual labor using a happy endings
consideration might all result in increased accomplishments.

Although these tasks are different from the specific tasks examined in the
current investigation, there are also implications for “real life” tasks much more related
to the current research as well. Exercise tasks such as physical therapy or the design of
group/team training sessions might result in greater success and increasing overall work
by adding slightly less difficult portions towards the end of a session. Additionally,
there are important implications for the classroom in terms of issues such as test design,
curriculum development and even classroom lectures. Adding review material to the
end of each of these could potentially increase retention and result in improved
evaluation of the classroom experience. The design of assessment sessions and research
protocols might also be enhanced by the considerations of the happy endings effect.

There are two ways in which the assessment situation can be considered. First, the less difficult portions of the testing could be left for late in the session and thus considered as the happy endings component. Assessment tests often have ceilings that require up to six consecutive incorrect responses. It may be that adding some easier questions onto the end of the task (perhaps two levels easier) would increase efficacy and result in improved response for the rest of the session. Finally, therapy sessions can be considered as psychological work. Ending a session with less emotionally difficult material may increase clients' abilities to integrate the content of the sessions into a conceptual framework and also change their overall perception of their personal difficulty.

Conclusions

Despite the limitations of the current research, results indicate a preference for happy endings such that longer tasks which require greater overall effort are evaluated as less difficult than shorter tasks requiring less overall effort. This preference was not unequivocal when future inclinations were measured. This study corroborates the finding that consideration of task difficulty probably is related to a combination of the worst and most recent moment. Over the long term, there may be implications in a number of different areas of life including the education, psychotherapy, psychological assessment, physical rehabilitation, and sports. Future research should help to develop a more thorough understanding of the mechanisms of evaluation and preference in
demanding circumstances. In situations where control can be exhibited over an ending, it may be best to conclude neither with a bang nor a whimper.
APPENDIX A

STATEMENT OF INFORMED CONSENT
Statement of Informed Consent

I hereby consent to participate in a study examining the relationship between exercise and cognitive tasks. The information obtained in this study may provide valuable information concerning the relationships between exercise and cognition, as well as information related to the development of protocols.

I understand that I will receive extra credit in my psychology class for my participation. I fully understand that I will be completing a variety of different tasks including a maximal knee extension task, sub-maximal knee extensions, and cognitive tests. I have been fully informed of the risks (e.g. muscle soreness, increased blood pressure during muscle contraction) involved in the strength testing procedures. I understand that the information given by me to the experimenter is confidential and that I will not be referred to by name in any subsequent publications or presentations of the research. Finally, I have been informed that I am free to withdraw this consent at any stage of this study.

If I have any questions or problems that arise in connection with my participation in this study, I should contact Nancy Diehl, the principal investigator, or Michael J. Mahoney, Ph.D., the research supervisor at 565-2671.

My signature below indicates that I understand the contents of this consent form, and that I have received a copy of this form for my records.

_____________________________       __________________________
Signature                                      Today's Date

APPENDIX B

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE
Physical Activity Readiness Questionnaire

1. Has your doctor ever said you have heart trouble? (Circle one) 1 = Yes 2 = No
   If yes, explain:__________________________________________________________

2. Do you frequently suffer from pains in your chest? (Circle one) 1 = Yes 2 = No
   If yes, explain:__________________________________________________________

3. Do you often feel faint or have spells of severe dizziness? (Circle one) 1 = Yes 2 = No
   If yes, explain:__________________________________________________________

4. Has a doctor ever said your blood pressure was too high? (Circle one) 1 = Yes 2 = No
   If yes, explain:__________________________________________________________

5. Has a doctor ever told you that you have a bone or joint problem such as arthritis that
   has been aggravated by exercise, or might be made worse with exercise? (Circle one)
   1 = Yes 2 = No If yes, explain:____________________________________________

6. Is there a good physical reason not mentioned here why you should not follow an
   activity program even if you wanted to? (Circle one) 1 = Yes 2 = No
   If yes, explain:__________________________________________________________
SUMMARY DIRECTIONS FOR QUESTIONS

Mark
A  if the part in Column A is greater
B  if the part in Column B is greater
C  if the two parts are equal.
D  if not enough information is given for you to decide.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.600 + 0.030 = 0.630)</td>
<td>(0.600 + 0.030 + 0.008)</td>
<td>(n &gt; b)</td>
</tr>
<tr>
<td>(\frac{60}{100})</td>
<td>(\frac{1}{4} = x%)</td>
<td>(\text{The simple interest earned on } $100.00) (\text{for 6 months if the rate is } 6%) (\text{per year})</td>
</tr>
<tr>
<td>(\frac{60}{100} = x)</td>
<td>(\frac{1}{4} = y%)</td>
<td>(\text{The value of } x) (\text{when } f(x) = 0)</td>
</tr>
<tr>
<td>(\frac{60}{100}) (\text{for 6 months if the rate is } 6%) (\text{per year})</td>
<td>(\text{when } x = 0)</td>
<td>(f(x) = 3x - 9)</td>
</tr>
<tr>
<td>(\text{The area of triangle } A)</td>
<td>(\text{The area of triangle } B)</td>
<td>(\text{The value of } x) (\text{when } f(x) = 0)</td>
</tr>
<tr>
<td>(\text{The area of triangle } A)</td>
<td>(\text{The area of triangle } B)</td>
<td>(\text{The area of triangle } A)</td>
</tr>
<tr>
<td>(f(x) = 3x - 9)</td>
<td>(\text{The value of } f(x)) when (x = 0)</td>
<td>(\text{The value of } f(x)) when (x = 0)</td>
</tr>
<tr>
<td>(\text{The value of } x) (\text{when } f(x) = 0)</td>
<td>(\text{The value of } f(x)) when (x = 0)</td>
<td>(\text{The value of } f(x)) when (x = 0)</td>
</tr>
<tr>
<td>(\text{The length of the heavy line})</td>
<td>(6 + a + 3 + 1)</td>
<td>(\text{The length of the heavy line})</td>
</tr>
<tr>
<td>(r, s, \text{ and } t) (\text{are consecutive whole numbers in increasing order})</td>
<td>(\text{The average arithmetic mean of } r) and (t)</td>
<td>(\text{The price per person if 91 people take the charter flight})</td>
</tr>
<tr>
<td>(r, s, \text{ and } t) (\text{are consecutive whole numbers in increasing order})</td>
<td>(\text{The average arithmetic mean of } r) and (t)</td>
<td>(\text{The price per person if 91 people take the charter flight})</td>
</tr>
<tr>
<td>(\text{An airline company is offering a charter flight to the Super Bowl. The price per person is } $220) (\text{plus an } $8.00) (\text{charge per person for each empty seat})</td>
<td>(\text{The price per person if 91 people take the charter flight})</td>
<td>(\text{The price per person if 91 people take the charter flight})</td>
</tr>
</tbody>
</table>
Directions: Each question in this part of the test is followed by four choices. Read each question and decide which one of the choices best answers the question.

If \( a_1 = \frac{a_2}{a_3} = \frac{a_4}{a_5} \) and \( a_1 = 1 \), what is the value of \( a_4? \)

- (A) \( \frac{1}{a_1} \)
- (B) \( \frac{a_3}{a_4} \)
- (C) 1
- (D) 3

If 1,000 pounds of fertilizer are needed for 228 acres of wheat, about how many pounds of fertilizer will be needed for 4,320 acres of wheat?

- (A) 600
- (B) 750
- (C) 9,000
- (D) 19,000

On Sunday, Jana drove from Omaha to Peoria, a distance of 600 kilometers. She left Omaha at 8:45 a.m. CST (Central Standard Time) and arrived in Peoria at 4:15 p.m. CST. What was her average (arithmetic mean) speed in kilometers per hour?

- (A) 50
- (B) 60
- (C) 70
- (D) 80

In a certain year, the average price of tapes rose from $7.00 to $7.63. What was the percent of increase in the average price of tapes during that year?

- (A) 1.09%
- (B) 9.00%
- (C) 12.11%
- (D) 63.00%
An electric company's present and proposed rate structures are shown above. At what level of kilowatt-hour usage are the electric charges equal under both structures?

(A) 50 kilowatt-hours
(B) 60 kilowatt-hours
(C) 70 kilowatt-hours
(D) 80 kilowatt-hours

It takes 3 goats 3 days to eat 3 acres of grass. At the same rate, how many acres of grass can 2 goats eat in 2 days?

(A) \( \frac{1}{3} \)
(B) \( \frac{2}{3} \)
(C) \( 1 \frac{1}{3} \)
(D) 2

A train traveled 915 miles at an average speed of 43 miles per hour. Which of the following equations can be used to find the number of hours the train traveled?

(A) \( h = \frac{915}{43} \)
(B) \( h = 915 - 43 \)
(C) \( h = \frac{43}{915} \)
(D) \( h = 43 \times 915 \)
A fair coin is tossed once. What is the probability that it will land heads up?

(A) 0
(B) \( \frac{1}{2} \)
(C) 1
(D) \( \frac{2}{3} \)

\[ \frac{1}{3} + \frac{2}{3} = \frac{13}{15} \]

Which of the following figures best illustrates the equation shown above?

(A)  
(B)  
(C)  
(D)  

0, 25, 50, ____, 100, 125, ...  

What is the missing term in the pattern above?

(A) 60
(B) 75
(C) 90
(D) 105
### SUMMARY DIRECTIONS FOR QUESTIONS

Mark
- **A.** if the part in Column A is greater,
- **B.** if the part in Column B is greater,
- **C.** if the two parts are equal,
- **D.** if not enough information is given for you to decide.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>The value of ( n )</td>
<td>The value of ( m )</td>
</tr>
<tr>
<td>if ( 2n + 1 = 11 )</td>
<td>if ( 2m - 1 = 11 )</td>
</tr>
<tr>
<td>The least even number greater</td>
<td>The greatest even</td>
</tr>
<tr>
<td>than 2</td>
<td>number less than 4</td>
</tr>
<tr>
<td>The value of ( a )</td>
<td>The value of ( a )</td>
</tr>
<tr>
<td>number if half ( a )</td>
<td>number if a third of ( a )</td>
</tr>
<tr>
<td>of the number is 2</td>
<td>is 3</td>
</tr>
</tbody>
</table>

Each inner square is formed by joining the midpoints of the sides of the next outer square.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>The area of region C</td>
<td>The sum of the areas of</td>
</tr>
<tr>
<td></td>
<td>regions A</td>
</tr>
<tr>
<td>The area of a circle</td>
<td>The area of a circle</td>
</tr>
<tr>
<td>with radius 4 meters</td>
<td>with diameter 4 meters</td>
</tr>
<tr>
<td>( f(x) = 3^x )</td>
<td>( f(x) = - (x + 2)^3 )</td>
</tr>
<tr>
<td>( f(-2) ) ( f(-4) )</td>
<td>( f(1) ) (-4)</td>
</tr>
</tbody>
</table>

The curve is symmetric about the origin.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>An odd number less than 5</td>
<td>An even number less than 10</td>
</tr>
</tbody>
</table>

C is the center of the circle.

The measure of \( \angle ACB \) Twice the measure of \( \angle APB \).
Directions: Each question in this part of the test is followed by four choices. Read each question and decide which one of the choices best answers the question.

FAMILY BUDGET

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Percent of Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>35%</td>
</tr>
<tr>
<td>Food</td>
<td>25%</td>
</tr>
<tr>
<td>Auto</td>
<td>15%</td>
</tr>
<tr>
<td>Clothing</td>
<td>10%</td>
</tr>
<tr>
<td>Entertainment</td>
<td>5%</td>
</tr>
<tr>
<td>Gifts &amp; Charity</td>
<td>5%</td>
</tr>
<tr>
<td>Savings</td>
<td>5%</td>
</tr>
</tbody>
</table>

Which two expenditures, when combined, account for more than one-half the monthly expenses of the family whose budget is shown in the chart above?

(A) Housing and auto
(B) Housing and food
(C) Housing and clothing
(D) Auto and food

In which quadrants of the rectangular coordinate plane does the graph of the equation \( y = 4 = (x + 3)^2 \) lie?

(A) I and II
(B) I and IV
(C) II and III
(D) III and IV

Which of the following statements is NOT applicable to all parallelograms?

(A) Opposite sides are parallel.
(B) Opposite sides are congruent.
(C) Diagonals are of equal length.
(D) Opposite angles are congruent

Joe and Marie's combined earnings after one day of work were $35.00. If Joe earned \( \frac{2}{3} \) as much as Marie earned, how much did Marie earn?

Which of the following equations, where \( j \) and \( m \) denote Joe's and Marie's earnings, respectively, could be used in solving the problem above?

(A) \( \frac{2}{3} m = j \)
(B) \( \frac{7}{3} m = 35 \)
(C) \( \frac{7}{3} j = 35 \)
(D) \( \frac{7}{3} j = m \)

Each of the gardens depicted in the figures above has a perimeter of 12 meters. The length of the rectangular garden is 2 times its width. What is the ratio of the area of the square garden to the area of the rectangular garden?

(A) \( 2 : 3 \)
(B) \( 3 : 4 \)
(C) \( 9 : 8 \)
(D) \( 12 : 12 \)
Which of the following is the equation for a line perpendicular to the line with equation $4x - y = -6$?

(A) $3x + 6y = 8$
(B) $2x - 6y = 4$
(C) $2x - 3y = -3$
(D) $x + 4y = 1$

In which of the following cases must quadrilateral $QRST$ (not shown) be congruent to quadrilateral $ABCD$ shown above?

(A) Three sides and two included angles of $QRST$ equal three corresponding sides and two corresponding angles of $ABCD$.
(B) One side and four angles of $QRST$ equal one corresponding side and four corresponding angles of $ABCD$.
(C) Four sides and one angle of $QRST$ equal four corresponding sides and one corresponding angle of $ABCD$.
(D) Two sides and the diagonals of $QRST$ equal two corresponding sides and the corresponding diagonals of $ABCD$.

STOP
APPENDIX D

IMPRESSIONS OF TRIALS QUESTIONNAIRES
Impressions of Test Taking

Please respond to the following items in relation to the MATH TESTS you just completed:

1. Suppose that we asked you to come back the day after tomorrow to repeat either the trial that you completed first or the trial that you completed second. Please indicate the strength of your preference by making a slash at the appropriate place on the line. For example, a all the way on one end of the line would indicate a very strong preference, whereas a slash closer to the middle would indicate a moderate preference.

   the first trial  \-----------------------------------------------\ the second trial

2. Of the two tests that you completed, which caused you the greater overall discomfort? Mark your preference by making a slash at the appropriate place on the line.

   the first trial  \-----------------------------------------------\ the second trial

3. Of the test taking trials that you completed, which trial lasted longer? Mark your preference by making a slash at the appropriate place on the line.

   the first trial  \-----------------------------------------------\ the second trial

4. Of the test taking trials, which trial was tougher for you to cope with? Mark your preference by making a slash at the appropriate place on the line.

   the first trial  \-----------------------------------------------\ the second trial
Impressions of Exercise Trials

Please respond to the following items in relation to the EXERCISE TASK:

1. Suppose that we asked you to come back the day after tomorrow to repeat either the trial that you completed first or the trial that you completed second (not the introductory trial, but the longer trials). Which trial would you choose? Please indicate the strength of your preference by making a slash at the appropriate place on the line. For example, a all the way on one end of the line would indicate a very strong preference, whereas a slash closer to the middle would indicate a moderate preference.

the first trial 1 ----------------------------------------------- 1 the second trial

2. Of the latter two exercise trials that you completed (not counting the introductory trial), which caused you the greater overall discomfort? Mark your preference by making a slash at the appropriate place on the line.

the first trial 1 ----------------------------------------------- 1 the second trial

3. Of the exercise trials that you completed (again, not counting the introductory trial), which trial lasted longer? Mark your preference by making a slash at the appropriate place on the line.

the first trial 1 ----------------------------------------------- 1 the second trial

4. Of the exercise trials you complete (again, not counting the introductory trial), which trial was tougher for you to cope with? Mark your preference by making a slash at the appropriate place on the line.

the first trial 1 ----------------------------------------------- 1 the second trial
APPENDIX E
GLOBAL EVALUATION QUESTIONNAIRES
GLOBAL EVALUATION QUESTIONNAIRE

For the task you just completed, we would like you to provide a global evaluation of how difficult the overall experience was, using a scale from 1 to 100, with 1 corresponding to "Not difficult at all" and 100 corresponding to "Extremely difficult."

How difficult was the overall experience?
For the task you just completed, we would like you to provide a global evaluation of how enjoyable the overall experience was, using a scale from 1 to 100, with 1 corresponding to "Not enjoyable at all" and 100 corresponding to "Extremely enjoyable."

How enjoyable was the overall experience? _______ (1 to 100)
APPENDIX F

POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)
PANAS

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. Use the following scale to record your answers.

<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 or not at all</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
</tbody>
</table>

___ interested  ___ irritable
___ distressed  ___ alert
___ excited  ___ ashamed
___ upset  ___ inspired
___ strong  ___ nervous
___ guilty  ___ determined
___ scared  ___ attentive
___ hostile  ___ jittery
___ enthusiastic  ___ active
___ proud  ___ afraid
APPENDIX G

DEMOGRAPHIC QUESTIONNAIRE
DEMOGRAPHIC INFORMATION

1. Age____  2. Gender (Circle one): 1=Male  2=Female

3. Height:____  4. Weight:____  5. Ethnicity:

6. Do you participate in vigorous aerobic exercise (e.g., jogging, swimming, stairclimber, treadmill) on a regular basis?
   If you answered "yes," please indicate how often you engage in aerobic exercise and for how long: __________ times per week at __________ minutes per time

7. Do you participate in vigorous strength exercise (e.g., weight lifting, nautilus, pushups) on a regular basis?
   If you answered "yes," please indicate how often you engage in strength exercise and for how long: __________ times per week at __________ minutes per time
Table 1

**Descriptive Statistics for Questionnaire responses and performance on tasks.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Evaluations Questionnaire</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.E. Exercise Evaluation</td>
<td>39.44</td>
<td>25.95</td>
</tr>
<tr>
<td>Short Exercise Evaluation</td>
<td>43.96</td>
<td>28.25</td>
</tr>
<tr>
<td>H.E. Cognitive Evaluation</td>
<td>48.90</td>
<td>26.38</td>
</tr>
<tr>
<td>Short Cognitive Evaluation</td>
<td>55.41</td>
<td>25.64</td>
</tr>
<tr>
<td><strong>Impressions of Trials Questionnaire</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Preference Score</td>
<td>41.05</td>
<td>28.90</td>
</tr>
<tr>
<td>Greater Discomfort Score</td>
<td>57.09</td>
<td>28.44</td>
</tr>
<tr>
<td>More Difficult to Cope Score</td>
<td>57.28</td>
<td>27.49</td>
</tr>
<tr>
<td>Longer Score</td>
<td>41.04</td>
<td>30.79</td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Preference Score</td>
<td>55.49</td>
<td>28.73</td>
</tr>
<tr>
<td>Greater Discomfort Score</td>
<td>53.30</td>
<td>32.42</td>
</tr>
<tr>
<td>More Difficult to Cope Score</td>
<td>49.44</td>
<td>30.75</td>
</tr>
<tr>
<td>Longer Score</td>
<td>37.31</td>
<td>30.83</td>
</tr>
</tbody>
</table>
PANAS

| Positive Mood Score | 26.46 | 7.40 |
| Negative Mood Score | 13.14 | 4.29 |

Cognitive Task (17 questions)

| H.E. Adjusted Percent Correct | 61.51 | 17.15 |
| Short Percent Correct         | 48.53 | 14.27 |

Total Work

| H.E. Trial, 12 repetitions   | 1071.00 | 575.15 |
| Short Trial, 9 repetitions    | 829.26  | 440.79 |

Note.  
a Possible scores range from 1-100 with higher scores indicating greater difficulty.

b Possible scores range from 1-100, with 50 indicating no preference. A score of 1 would indicate a very strong preference for the happy endings trial, 100 would indicate a strong preference for the short trial.
Table 2

Participants who had no preference for the happy endings trial or the short trial in terms of actual numbers and percentages.

<table>
<thead>
<tr>
<th>Questions</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Preference Score</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Greater Discomfort Score</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>More Difficult to Cope Score</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Longer Score</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td><strong>Exercise</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Preference Score</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Greater Discomfort Score</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>More Difficult to Cope Score</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Longer Score</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>
Table 3

Correlation matrix indicating relationships among continuous variables.

<table>
<thead>
<tr>
<th></th>
<th></th>
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Note: * p < .05, two tailed; ** p < .01, two tailed; H.E. refers to Happy Endings; Ex. = exercise; Cog. = Cognitive; Eval. = Evaluation
REFERENCES


