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# Challenge seeking: The relationship of achievement goals to choice of task difficulty level in ego-involving and neutral conditions

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**Abstract** We investigated Nicholls' (Psychol Rev 91: 328–346, 1984) predictions concerning the impact of achievement goals (manipulated and measured) on risk-taking behavior. Participants were given ego-involving or neutral instructions and chose the difficulty levels for 10 nonverbal cognitive problems they performed. Consistent with Nicholls' prediction, a moderate level of difficulty was initially preferred following neutral instructions. In contrast, following ego-involving instructions, women tended to select a lower level of difficulty and men a higher level of difficulty, reflecting the fact that men reported higher levels of perceived ability than women. Endorsements of mastery- and performance-approach goals were generally positively related to the levels of difficulty selected across trials. Endorsement of performance-avoidance goals was negatively related to the levels of difficulty selected, but the relationship diminished in later trials. During the later trials, participants given ego-involving instructions selected higher levels of difficulty than those given neutral instructions and men selected higher levels of difficulty than women.

**Keywords** Achievement goals · Choice of difficulty · Achievement motivation · Dynamics of action · Gender differences

## Introduction

According to achievement goal theory (Ames and Archer 1987; Dweck 1986; Nicholls 1984), the types of goals individuals adopt influence their achievement behaviors, self-evaluations, and affective responses to achievement situations. Research demonstrates that achievement goals influence performance, study strategies, and intrinsic task interest (e.g., Elliot and McGregor 1999; Elliot et al. 1999; Harackiewicz et al. 1997; Meece et al. 1988; Nolen 1988). Yet one achievement behavior which has not received much attention from this perspective is risk preference (i.e., preference for task difficulty levels). This is surprising in that risk preference has been a major concern of achievement motivation theory since its inception (e.g., Atkinson 1957). Interestingly, Nicholls (1984) developed some predictions for how achievement goals might influence risk preferences in his early work. However, little research has directly tested his predictions, in particular with respect to cognitive tasks. The current research was undertaken to investigate the relationship between achievement goals and choice of task difficulty levels across repeated trials of a task.

### Nicholls' (1984) achievement goal framework

In Nicholls' (1984) original presentation of achievement goal theory, he defined the purpose of achievement behaviors as the development or demonstration of competence. He further proposed that there are two different

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conceptions of ability which are associated with different types of goals and achievement behaviors. When the more differentiated conception of ability is used, individuals judge their competence with respect to normative standards; one must perform better than others to demonstrate competence, so mere improvement may not be sufficient to demonstrate competence. When individuals are ego-involved, they define competence in this normative sense and tend to adopt performance goals which focus on demonstrating superior competence or avoiding a demonstration of incompetence. Ego involvement can be induced by presenting tasks as tests of valued skills or abilities (e.g., intelligence), emphasizing evaluation, or inducing self-focus (Nicholls 1984, 1989). In other situations individuals judge their competence in terms of improvement and mastery. When individuals are task-involved, they use this less differentiated conception of ability and tend to adopt mastery goals which focus on learning and skill development. Task involvement can be fostered by providing moderately challenging achievement tasks and minimizing evaluation.

Nicholls (1984) predicted that how individuals respond to performance difficulties would depend on whether they were task- or ego-involved. Task-involved individuals are likely to increase their efforts to overcome obstacles. In contrast, the impact of performance difficulties on ego-involved individuals' effort expenditure is predicted to depend on their perceived ability (i.e., judgments of ability relative to others). Those with high perceived ability are likely to try harder. Those with low perceived ability are predicted to demonstrate a decline in performance because they are threatened by the possibility of demonstrating low ability.

Preferences for task difficulty levels should depend on the conception of ability employed and the corresponding achievement goal adopted. When individuals use the less differentiated conception of ability and adopt mastery goals, they should prefer tasks of moderate difficulty which offer the best opportunity to demonstrate competence in terms of improvement (Nicholls 1984). In contrast, when the more differentiated conception of ability is employed (i.e., ego involvement), those who are confident of their abilities should prefer tasks of moderate to high difficulty where success would indicate high normative ability. For those who doubt their ability, failure at moderately difficult tasks would indicate below average ability and therefore would be threatening. If committed to demonstrating high ability those with doubts might select high levels of difficulty where their probability of succeeding is low, but failure would not imply low ability. If they are fairly certain they lack ability, they may simply select very easy difficulty levels where they can succeed and avoid demonstrating low ability.

Nicholls' (1984) predictions provided an explanation for inconsistent patterns of results in achievement motivation research designed to test Atkinson's (1957) predictions concerning risk preference. Achievement motivation theory as originally formulated by Atkinson (1957), proposes that achievement behaviors are a function of an approach tendency, need for achievement, and an avoidance tendency, fear of failure. Individuals who are higher in the need for achievement than fear of failure should prefer tasks of moderate difficulty. In contrast, individuals who are higher in fear of failure than need for achievement should prefer either very easy or very hard tasks. Support for these predictions has not been consistently found. Indeed, some early studies demonstrated an overall preference for moderate difficulty regardless of the relative strengths of need for achievement and fear of failure (e.g., Atkinson and Litwin 1960; Cooper 1983). Nicholls (1984), proposed that the inconsistent support for Atkinson's (1957) original predictions was a result of differences in the type of involvement (task/neutral or ego) induced by the experimental conditions. He proposed that Atkinson's predictions would hold in ego-involving conditions, but that all participants would prefer moderate difficulty in task-involving conditions. Most research on risk preference did not vary the nature of the situation. Consequently, Nicholls (1984) reviewed past research and classified the studies in terms of task/neutral involvement versus ego involvement, finding some support for his prediction.

Nicholls' predictions follow from the fact that fear of failure was often assessed with a test anxiety questionnaire (see Atkinson 1964). Research has consistently demonstrated that the debilitating effects of test anxiety are exacerbated in ego-involving conditions and can be minimized by focusing attention away from evaluation and more on the task at hand (see Wine 1971, 1982); Nicholls (1984) also presented evidence that individuals high in test anxiety tend to be lower in perceived ability. Thus we would expect those higher in test anxiety to demonstrate preferences for extreme difficulty levels in ego-involving conditions, but to prefer moderate difficulty in more task-involving or neutral conditions.

## Recent developments in achievement goal theory

Originally, achievement goal theory (Dweck 1986; Nicholls 1984) proposed two types of achievement goals (i.e., task/mastery and ego/performance) which could be manipulated or measured. Recently, Elliot and his colleagues have proposed the trichotomous achievement goal framework (Elliot and Church 1997; Elliot and Harackiewicz 1996). This approach suggests that performance goals should be separated into performance-approach goals, which are aimed at demonstrating competence in the normative sense, and performance-avoidance goals, which are concerned with avoiding a demonstration of normative

incompetence. Elliot and Church (1997) proposed that achievement goals are the more proximal causes of behaviors whereas need for achievement, fear of failure and competence perceptions are more distal causes having their influence through the goals. Elliot and Church (1997) found that need for achievement is positively related to mastery goals and fear of failure is positively related to performance-avoidance goals. Both need for achievement and fear of failure are positively related to performance-approach goals (see Elliot and Church 1997; Elliot and McGregor 1999). In addition, performance-avoidance goals are negatively related to self-assessments of competence while performance-approach and mastery goals are positively related to such self-perceptions. Thus individuals with low perceived ability would be more likely to endorse performance-avoidance goals and those with high perceived ability would endorse performance-approach goals. In terms of Nicholls (1984) predictions for choice of difficulty level in ego-involving conditions, we would expect individuals high in performance-approach goals to prefer tasks of moderate to high difficulty and those high in performance-avoidance goals to prefer low levels of difficulty.

Classroom-based studies typically find that performance-approach goals are positively related to performance, but performance-avoidance goals are negatively related to performance, perceived ability, and self-esteem (e.g., Elliot and McGregor 1999; Elliot et al. 1999; Harackiewicz et al. 1997; Harackiewicz et al. 2000). Hence, the negative effects of manipulations of ego-involvement on performance stem primarily from their effects on individuals' concerns with looking incompetent (i.e., performance-avoidance goals).

Elliot and McGregor (2001) have further proposed that mastery goals should also be separated into mastery-approach and mastery-avoidance goals. Mastery avoidance is described as a concern with losing the level of competence one has already achieved or misunderstanding new material. This distinction is quite new and the role of mastery-avoidance in achievement situations is not well specified. The current study included measures of all four achievement goals to investigate how they relate to choice of difficulty levels under ego-involving and neutral conditions. However, no formal predictions were made for mastery-avoidance goals.

## Prior research on risk preference

In a classic study of risk preference, Atkinson and Litwin (1960) had college men perform a ring toss game in which they selected the distance they would toss from. Those higher in fear of failure than need for achievement did demonstrate a greater preference for standing very close or very far away than those higher in need for achievement than fear of failure, but overall each group showed a stronger preference for moderate difficulty than for the extremes.

Later studies of risk preference (e.g., Kuhl and Blankenship 1979b) were based on elaborated predictions derived from the dynamics of action. Atkinson and Birch (1970, 1974) expanded the original theory of achievement motivation to take into account dynamic changes across time in the approach and avoidance tendencies influencing behavior. According to the dynamics of action, the strength of approach and avoidance tendencies can change across time growing stronger when aroused by stimuli in the environment and growing weaker when expressed in behavior. The relative strengths of these opposing tendencies at any given time will determine behavior. With this new approach, it was still predicted that individuals with a stronger need for achievement than fear of failure would prefer moderate difficulty initially; however, those with relatively stronger fear of failure were predicted to prefer a lower level of difficulty, given the stronger avoidance tendency. While individuals are engaging in an achievement task, the impact of the avoidance tendency is predicted to decline. It is also predicted that over time all individuals will prefer higher levels of difficulty as they succeed at lower levels. However, this trend will diminish as more failure is encountered.

Kuhl and Blankenship (1979a) found support for these predictions in an experiment in which participants were able to choose the level of difficulty of the task they performed across numerous trials. On the initial set of trials they found that individuals higher in need for achievement than fear of failure preferred a moderate level of difficulty. Participants higher in fear of failure preferred lower difficulty levels. In addition, all types of participants preferred higher levels of difficulty on later trials than earlier trials, although the effect was only marginally significant for women. A similar pattern was reported by Rocklin and O'Donnell (1987) who compared participants classified as high or low in test anxiety.

In a related study by Slade and Rush (1991), all individuals initially preferred a moderate level of difficulty regardless of the relative strengths of need for achievement and fear of failure. This inconsistency with the Kuhl and Blankenship (1979a) study may be because the task was less ego-involving. The Kuhl and Blankenship study described the test items as similar to those found on IQ tests, inducing ego involvement. Slade and Rush (1991) had participants performed a work simulation, monitoring an aircraft instrument panel. Slade and Rush (1991) also noted a general increase in the level of difficulty preferred across the first five trials, but this trend diminished on the later trials presumably as participants encountered more failure.

### Gender differences in risk preference

Several studies of risk preference have noted gender differences. For example, Slade and Rush (1991) and Sorrentino et al. (1992) reported that women preferred lower levels of difficulty than men. In addition, in the Kuhl and Blankenship (1979a) study, the preference for increasing levels of difficulty was only marginally significant for women.

Research generally finds that women report lower expectancies and competence beliefs than men, particularly for stereotypically male tasks or domains (Eccles et al. (1993); Hyde and Kling 2001; Meece et al. 2006). Eccles et al. (1993) have noted that despite these gender differences in competence beliefs, there are often no performance differences. Even though women's lower expectancies do not necessarily interfere with their performance, they may very well lead to differences in choice of difficulty level. The women may be selecting lower levels of difficulty due to these lower competence beliefs. In the current experiment we would expect women to report lower levels of perceived ability and to prefer lower levels of difficulty than men.

### The current study

The current study was undertaken in part to investigate how ego-involving and neutral instructions influence individuals' choice of difficulty levels both initially (i.e., first choice trial) and across multiple trials of a task. We measured achievement goals at the end of the performance period so as not to induce ego involvement in the neutral condition. Consequently we cannot infer causal relationships between goal endorsements and difficulty level preferences.

In terms of Nicholls' (1984) theory, we would expect neutral instructions to lead to an initial preference for moderate difficulty. Following ego-involving instructions, individuals high in performance avoidance are predicted to choose a lower level of difficulty thus bringing the group mean down. Based on the dynamics of action and prior studies, we expected all participants to show a general preference for higher levels of difficulty across the earlier trials. However, based on Slade and Rush (1991) this pattern should flatten out in the later trials.

**Hypothesis 1** On average, individuals given ego-involving instructions will initially select a level of difficulty significantly lower than moderate.

**Hypothesis 2** Individuals given neutral instructions will initially prefer a moderate level of difficulty.

**Hypothesis 3** Individuals given ego-involving or neutral instructions will demonstrate a general preference for higher levels of difficulty across the early trials.

We also made predictions of how participants' endorsement of the different achievement goals would relate to the choice of difficulty level across trials.

**Hypothesis 4** The endorsement of mastery-approach goals will be positively related to the level of difficulty chosen initially and during early and later trials.

**Hypothesis 5** The endorsement of performance-approach goals will be positively related to the level of difficulty chosen initially and during early and later trials.

**Hypothesis 6** The endorsement of performance-avoidance goals will be negatively related to level of difficulty chosen initially and during the early trials.

**Hypothesis 7** The negative relationship between endorsement of performance-avoidance goals and level of difficulty chosen initially and during the early trials will be stronger in the ego-involving condition than the neutral condition.

**Hypothesis 8** The endorsement of performance-avoidance goals will relate less strongly to the level of difficulty chosen in the later trials compared to the early trials.

Consistent with past research, we expected to find several gender differences:

**Hypothesis 9** Women will report significantly lower perceived ability for the task than men.

**Hypothesis 10** Women will select lower levels of difficulty than men on the initial, early and later trials.

## Method

### Participants

One hundred sixteen introductory psychology students participated in this study in partial fulfillment of a course requirement. Each participant completed the study in a one-on-one session with the experimenter. Due to missing data, analyses involve 110–112 participants. The median age was 19 and the majority of the participants were male (69%) and White (83%).

### Materials

Participants worked on cognitive problems which they selected based on level of difficulty. The set of cognitive problems was developed from Project Talent Questions (Flanagan 1976) and from the following website with permission: http://nicologic.free.fr/. All of the problems were presented in a multiple choice format. Extensive preliminary testing was done to classify the items according to

difficulty level. Multiple items roughly comparable in difficulty level were compiled. All participants were given the same starting problem which was moderately difficult. They were then given the opportunity to choose the difficulty level for each of the following 10 problems, receiving correct/incorrect feedback on each problem before making a choice for the next problem.

### Questionnaires

Questionnaires were completed at the end of the study. The questionnaires included several manipulation check items to be sure that the participants in the ego-involving condition agreed that (a) the problems were assessing intelligence and (b) the experimenter was interested in comparing their performance to that of other participants. A third manipulation check item was included to ensure that the participants in the neutral condition realized that the problems were designed to examine individuals' learning processes. These items were evaluated on five-point scales anchored with 1 = *Not at all* and 5 = *Very much so*.

Achievement goals were measured with scales developed by Elliot and his colleagues (Elliot and Church 1997; Elliot et al. 1999; Elliot and McGregor 2001). The achievement goals were measured at the end of the study so as not to interfere with the instructional manipulation. We did not want to prime social comparison for the participants given neutral instructions. As recommended by Elliot (2005), the items were adapted to focus on the task at hand. A seven-point response scale was used, anchored with *not at all true of me* and *very true of me* at the endpoints. Six items comprised each of the scales except mastery avoidance which had three items. An example mastery-approach item is "I wanted to develop my skills for solving these types of problems" ($\alpha = .88$ in this study). The performance-approach items focused on performing better than others (e.g., "It was important for me to do well compared to others on this task," $\alpha = .93$ in this study). In contrast, the performance-avoidance items focused on a concern with performing poorly (e.g., "I just wanted to avoid doing poorly on this task," $\alpha = .86$ in this study). Finally the mastery-avoidance items expressed a fear of not achieving all that one could (e.g., "I was worried that I might not learn all the strategies that I possibly could from doing this task," $\alpha = .82$). There is strong evidence for the reliability and validity of these scales when used with young adults (Elliot and Church 1997).

We also assessed perceived ability using items adapted from Duda and Nicholls (1992) and from Miller et al. (1996). This four-item scale assesses perceived ability relative to others completing the problems. Participants expressed their agreement or disagreement using a six-point rating scale. The coefficient alpha was .87.

### Procedure

Participants were greeted by an experimenter and were escorted to the experiment room for a single-subject session. After obtaining informed consent, the experimenter briefly described the timeline of the session and the goals of the study. The description depended on which condition the participant was randomly assigned to. In the ego-involving condition participants were told that the problems they would be working on were designed to assess intelligence and that we would be comparing their performance to that of other students ($n = 54$). The neutral condition was designed to minimize ego involvement. In this condition the problems were said to be like brain teasers and that we were interested in understanding the learning process as the participants developed their skills at the task ($n = 58$). We had hoped to induce task-involvement in this latter condition, but the fact that the experimenter would be giving correct/incorrect feedback to the participants might detract from task involvement.

In both conditions, participants were informed that after completing the first problem, they would be allowed to choose the level of difficulty of each of the following problems. The levels of difficulty ranged from 1 to 9 and participants were provided with a sheet of paper indicating that lower numbers refer to easier problems and higher numbers to harder problems.

After the experimenter finished reading the instructions, participants were presented with the initial problem and were told that it was moderately difficult (level 5). Participants were allowed to take as much time as they wanted to complete the problem. Participants received correct/incorrect feedback based on their response and were asked to choose the level of difficulty of the next problem. After having completed 5 problems in this manner, participants were reminded that either we would be comparing their performance to that of other participants (ego-involving condition), or that we were interested in their learning process (neutral condition). We refer to the first 5 choice trials as the early trials and the last 5 choice trials as the later trials. After having completed 11 problems, participants were presented with a set of questionnaires to complete. The experimenter left the room while the participant completed the questionnaires. There was no time limit placed on completing each problem, but all participants completed the experiment in less than an hour.

## Results

### Preliminary analyses

Our initial analyses revealed that the instructional manipulation was successful. Those in the ego-involving

condition, compared to those in the neutral condition, were more likely to agree that the problems were assessing intelligence ($t(110) = 3.45$, $p < .001$, $d = .65$, $M$s = 3.89 and 3.28, respectively) and that the experimenter was interested in comparing their performance to that of others ($t(110) = 3.05$, $p < .01$, $d = .58$, $M$s = 3.46 and 2.83, respectively). In addition, those in the neutral condition were more likely to agree that the experimenter was interested in their strategies than were those in the ego-involving condition ($t(110) = -2.38$, $p < .05$, $d = -.45$, $M$s = 2.66 and 2.11, respectively).

We also checked to see if the instructional manipulation and/or gender had an impact on the measures of achievement goals assessed at the end of the problem-solving session. Those in the ego-involving condition scored higher on the performance-avoidance goal than those in the neutral condition, ($F(1, 107) = 8.65$, $p < .01$, partial $\varepsilon^2 = .08$, $M$s = 3.87 and 3.24, respectively), but no statistically significant differences were observed for the other three goals. This pattern is consistent with Grant and Dweck's (2003) suggestion that the Elliot performance-approach goal does not tap the negative aspects of ego involvement whereas the performance-avoidance scale does. The fact that the instructional manipulation did not influence the mastery-approach scale suggests that the neutral instruction did not induce task involvement although it did succeed in reducing ego involvement. No gender differences were found for the achievement goals.

Because the participants could choose the problems they worked on, aside from the first problem, we could not really directly compare performance. Interestingly, the average number of problems solved correctly was not significantly different in the ego-involving and neutral conditions, $F(1, 108) = .26$, $p > .10$, or for men compared to women, $F(1, 108) = .54$, $p > .10$. On the average, participants correctly solved about 7 problems out of 11. Participants in both conditions made their choices so that they correctly solved more problems than they got wrong.

Table 1 presents descriptive statistics and correlations among the major variables. In general the achievement goals were positively correlated which is consistent with previous laboratory studies (e.g., Senko and Harackiewicz 2005). The approach goals (both mastery and performance) were positively correlated with the level of difficulty selected initially and on the early and later trials. The goals were not significantly related to total score. However, perceived ability was related to total score suggesting that participants may have used the performance feedback in part to estimate their ability. The actual level of difficulty selected was also related to perceived ability.

## Choice of initial difficulty level in ego-involving and neutral conditions

Hypothesis 1 predicted that individuals in the ego-involving condition would initially select a level of difficulty lower than moderate (level 5). Hypothesis 2 predicted that the level of difficulty selected by those in the neutral condition would be moderate. Recall that all participants completed a moderately difficult problem (level 5) first and then made their initial selection following correct/incorrect feedback. To test these hypotheses we conducted a 2 (gender) × 2 (instructional condition) ANOVA on the level of difficulty selected initially and then examined the confidence intervals around the group means. We found a significant effect for gender, $F(1,108) = 7.38$, $p < .01$, partial $\varepsilon^2 = .06$, and a significant interaction between gender and condition, $F(1,108) = 6.84$, $p < .01$, partial $\varepsilon^2 = .06$. In the ego-involving condition, women selected a lower level of difficulty for the first free choice trial, $M = 4.28$, while men selected a higher level of difficulty, $M = 6.00$. A 95% confidence interval constructed around the mean for men did not include the value 5.00 (5.48–6.52). Thus, the ego-involving instruction actually led to the choice of a higher level of difficulty for the men contrary to Hypothesis 1. However, the choices of the women were more consistent with our prediction. The 95% confidence interval for women just included the value 5.00 (3.54–5.02), but a 94% interval did not (3.57–4.99). In the neutral condition, the average difficulty levels selected by men ($M = 5.27$) and women ($M = 5.24$) were not significantly different. Furthermore, 95% confidence intervals for the neutral means included 5.00 (4.78–5.76 for men, 4.47–6.00 for women) providing support for Hypothesis 2.

## Choice of difficulty levels across trials

Hypothesis 3 predicted that across the early trials participants would select higher levels of difficulty. We expected the difficulty levels chosen might level out more in the later trials as was reported by Slade and Rush (1991). We decided to use Hierarchical Linear Modeling (Raudenbush et al. 2001) to examine the pattern of levels of difficulty chosen across trials so we could take into account the nested nature of the data and the impact of the correct/incorrect feedback across trials. We conducted separate analyses for early trials (1–5) and the later trials (6–10). We first graphed the average level of difficulty selected across trials adjusting for feedback on the first moderately difficult problem. Figure 1 displays the pattern of results. There is a general trend towards increasing difficulty levels across the early trials consistent with previous findings (e.g., Kuhl and Blankenship 1979a). However, for both men and women, after trial 5 the conditions separate quite a

**Table 1** Correlations and descriptive statistics for primary variables

| Measure | Mean | SD | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Condition | .52 | .50 | | | | | | | | | | |
| (2) Gender | .31 | .46 | −.06 | | | | | | | | | |
| (3) Mastery approach | 4.09 | 1.27 | −.16 | −.13 | | | | | | | | |
| (4) Mastery avoidance | 2.84 | 1.19 | −.19* | .02 | .63** | | | | | | | |
| (5) Performance approach | 4.13 | 1.54 | −.15 | −.14 | .54** | .46** | | | | | | |
| (6) Performance avoidance | 3.55 | 1.26 | −.25** | .08 | .30** | .55** | .59** | | | | | |
| (7) Total score | 7.15 | 1.38 | .02 | −.06 | .09 | -.09 | .10 | .08 | | | | |
| (8) Trial 1 chosen diff. level | 5.31 | 1.66 | −.05 | −.26** | .28** | .10 | .22** | −.12 | −.06 | | | |
| (9) Ave. diff. early trials | 5.71 | 1.49 | −.05 | −.26** | .37** | .13 | .30** | −.08 | −.01 | .77** | | |
| (10) Ave. diff. later trials | 6.27 | 1.79 | −.16 | −.36** | .42** | .16 | .35** | .08 | .00 | .48** | .66** | |
| (11) Perceived ability | 4.18 | .94 | −.01 | −.43** | .32** | .02 | .45** | −.04 | .30** | .41** | .53** | .46** |

*Note*: Condition coded 0 = ego, 1 = neutral; Gender coded 0 = men, 1 = women; Achievement goals measured on 7-point scales; Perceived ability measured on a 6-point scale

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

bit with those in the ego-involving condition selecting higher levels of difficulty than those in the neutral condition. There also appears to be a quadratic trend for some groups during the early trials, so we decided to incorporate a quadratic term into the HLM analysis.

HLM allows for the simultaneous analysis of different levels of predictors of change in choice of difficulty level across time. We have two levels of analysis. The lower level of analysis, Level 1, effectively calculates a regression equation for each individual. Thus we try to model the level of difficulty selected across trials as a function of time and feedback within person. The Level 2 analysis uses between person variables, in this case gender and instructional condition, to predict differences in the coefficients (i.e., slopes and intercepts) estimated at Level 1. As recommended by Raudenbush and Bryk (2002) we ran three models for each analysis. We first ran an unconditional model which only included an intercept and error term to predict selected difficulty level. This model allows us to estimate the proportion of variance in selection of difficulty levels which is between-persons versus within-persons. We then ran a within-persons Level 1 model predicting level of difficulty selected as a function of trials, feedback and in the case of the early trials, trial squared to capture any quadratic trend. We used the Level 1 analysis to determine which coefficients (intercept, slopes) varied enough between persons to be estimated by a Level 2 model. For those coefficients with enough between-persons variance, Level 2 models were added.

*Analysis of early trials (1–5)*

In the analysis of the early trials, we first ran an unconditional model which only contained an intercept and error term to determine how much variance is between-persons (intraclass correlation) and how much is within-persons. This analysis indicated that 49% of the variance was between-persons. We next ran the Level 1 model. In this analysis, level of difficulty chosen across trials, an index for trial (0 through 4), the index squared, and feedback (coded as failure = 0 or success = 1) were measured at the

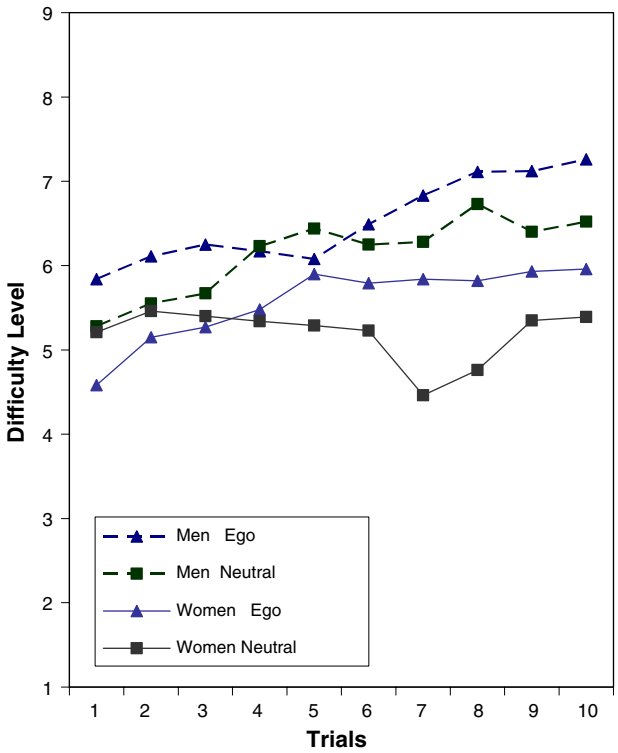


**Fig. 1** Mean level of difficulty selected across the 10 trials for men and women in the ego-involving and neutral conditions adjusted for feedback on the first assigned moderately difficult problem

within-persons level. Thus, for each participant a regression model was set up predicting chosen level of difficulty from trial, trial squared, and feedback on the previous trial:

$$Y_{it} = \beta_{0i} + \beta_{1i}(\text{Trial})_{it} + \beta_{2i}(\text{Feedback})_{it} + \beta_{3i}\left(\text{Trial}^2\right)_{it} + r_{it} \quad (1)$$

where $Y_{it}$ represents the level of difficulty chosen by person $i$ (for $i = 1$ to 112) for trial $t$ (where $t = 0$ to 4 for trials 1 through 5); $\beta_{0i}$ represents the mean difficulty level chosen by person $i$ when Trial = 0 (first trial) and Feedback = 0 (failure on previous trial); $\beta_{1i}$ represents the average linear rate of change in the selected difficulty level across trials; $\beta_{2i}$ represents the expected change in the selected difficulty level when Feedback changes from failure (0) to success (1) for person $i$; $\beta_{3i}$ represents the rate of acceleration in the selected difficulty level across trials, and $r_{it}$ represents random within person error of prediction for person $i$ on trial $t$.

The Level 1 model accounted for 44.5% of the within-persons variance. The estimate of the intercept, $\beta_{0i}$, was 4.61 ($p < .001$), and the estimates of the slopes for trials ($\beta_{1i} = .42$, $p < .001$) and feedback ($\beta_{2i} = .96$, $p < .001$) were positive and significant. The significant coefficient for trials supports Hypothesis 3 that the level of difficulty chosen increases across the early trials. Feedback had a positive effect on the level of difficulty chosen. The coefficient for the quadratic term was marginally significant ($\beta_{3i} = -.06$, $p < .10$); however, the analysis indicated there was variance that could be explained for this term at Level 2. The analysis of the Level 1 model also revealed that there was additional variance in $\beta_{0i}$, the intercept, which could be explained by Level 2 moderators, but not for $\beta_{1i}$ or $\beta_{2i}$ although the latter terms were statistically significant.

The Level 2 model added condition (coded as ego-involving = 0 and neutral = 1), gender (coded as men = 0, women = 1) and the interaction of condition and gender as person-level variables. This dummy coding allows the intercept to be directly interpreted as the choice for men in the ego-involving condition, in other words the zero points for condition and gender.

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{Condition})_i + \gamma_{02}(\text{Gender})_i + \gamma_{03}(\text{Condition} \times \text{Gender})_i + u_{0i} \quad (2)$$

$$\beta_{3i} = \gamma_{30} + \gamma_{31}(\text{Condition})_i + \gamma_{32}(\text{Gender})_i + \gamma_{33}(\text{Condition} \times \text{Gender})_i + u_{3i} \quad (3)$$

$\gamma_{00}$ represents the grand mean for the level of difficulty chosen for men in the ego-involving condition; $\gamma_{30}$ represents the mean acceleration in difficulty level chosen across trials for men in the ego-involving condition; $\gamma_{01}$ and $\gamma_{31}$ represents the change in the intercept and quadratic slope when neutral instructions are given rather than ego-involving; and $\gamma_{02}$ and $\gamma_{32}$ the change due to gender.

If the effects of condition and gender depend on each other, the interaction terms, $\gamma_{03}$ and $\gamma_{33,}$ would be statistically significant. Finally, $u_{0i}$ and $u_{3i}$ represent the error terms in predicting the intercept and quadratic slope, respectively.

The Level 2 analysis revealed statistically significant interaction effects, $\gamma_{03} = 1.48$, $p < .01$ and $\gamma_{33} = -.15$, $p < .01$. We investigated these interactions by altering the dummy coding so that different groups would be represented by the zero point. For the intercept term, men were higher than women only when ego-involving instructions were given ($\gamma_{02} = -1.61$, $p < .001$) and ego-involving instructions led to a higher level of difficulty chosen for men only ($\gamma_{01} = -.66$, $p < .05$). The quadratic term was statistically significant for men in the ego-involving condition ($\gamma_{30} = -.10$, $p < .05$) and for women in the neutral condition ($\gamma_{30} = -.09$, $p < .05$). The patterns in Fig. 1 also show a weak curvilinear trend for these two groups. The Level 2 factors accounted for 5% of the between-persons variance after controlling for the Level 1 factors.

*Analysis of later trials (6–10)*

For the later trials, analysis of the unconditional model indicated that 48% of the variance was between-persons. The quadratic term in the Level 1 model was not statistically significant and did not have variance that could be explained at Level 2, so the term was dropped. In the revised Level 1 model the intercept was $\beta_{0i} = 5.65$ ($p < .001$), somewhat higher than for the early trials. The slope for trials was positive, but not quite statistically significant, $\beta_{1i} = .11$, $p < .07$, which suggests the levels of difficulty chosen are leveling out across the later trials as was observed by Slade and Rush (1991). The slope for feedback was positive and significant, $\beta_{2i} = .64$, $p < .001$. This Level 1 model accounted for 18% of the within-persons variance. The intercept and slope for trials had additional variance that could be explained at Level 2, but feedback did not. In the Level 2 analysis the interactions of condition and gender were not statistically significant so they were dropped from the model. In addition, neither condition nor gender accounted for variance in the slope for trials. The intercept was influenced by both the condition, $\gamma_{01} = -.67$, $p < .05$, and gender, $\gamma_{02} = -1.34$, $p < .001$. These coefficients reflect women selecting lower levels of difficulty than men and participants in the neutral condition selecting lower levels of difficulty than participants in the ego-involving condition. The Level 2 factors accounted for 6.5% of the between-persons variance after controlling for the Level 1 factors.

## Achievement goals and choice of difficulty level

We further investigated the relationship between achievement goals and the level of difficulty selected on the first trial, and the average difficulty level selected on the early and later trials. We expected the approach goals to relate to the selection of higher levels of difficulty (Hypotheses 4 and 5) and performance avoidance to initially correlate negatively with the levels of difficulty selected (Hypothesis 6). Performance avoidance was predicted to interact with the instructional condition such that its negative relationship would be stronger when ego-involving instructions were given (Hypothesis 7). We used hierarchical regression to test these hypotheses. The instructional condition, gender, and the interaction of condition and gender were controlled in the first block of predictors along with the feedback received on the first problem. The second block of predictors included the four achievement goals. In the third block we tested the interaction between performance avoidance and the instructional condition. We also checked for two-way interactions between condition and each of the other achievement goals and between gender and the achievement goals, but none of these interactions were statistically significant. Tables 2 and 3 contain the results of the first two blocks of the hierarchical regression analysis. None of the interactions involving performance avoidance and the instructional condition were statistically significant, so only blocks 1 and 2 are displayed in the tables.

In the analysis of initial level of difficulty chosen, adding the achievement goals in block 2 accounted for an additional 8% of the variance. Endorsement of performance-approach goals was positively related to initial level of difficulty chosen while endorsement of performance-avoidance goals was negatively related, providing support for Hypotheses 5 and 6. Endorsements of the mastery goals (approach and avoid) were not significantly related to the initial level of difficulty chosen. Thus, Hypothesis 4, which predicted that mastery-approach goals would positively relate to the level of difficulty selected, was not supported. Hypothesis 7 predicted that the performance-avoidance goals would have a stronger negative relationship in the ego-involving condition, but no interaction with condition was found ($\beta = -.032$, $p > .10$).

For the average level of difficulty selected during the early trials (see Table 3), the achievement goals added in block 2 accounted for an additional 16% of the variance. Both mastery-approach and performance-approach goals had positive relationships with average difficulty level chosen and performance-avoidance had a significant negative relationship. These results provide support for Hypotheses 4, 5, and 6. Mastery-avoidance did not have a significant relationship with average level of difficulty selected when the other goals were controlled for. There also was no support for Hypothesis 7 which predicted the relationship for performance avoidance would be stronger in the ego-involving condition, $\beta = -.064$, $p > .10$.

**Table 2** Hierarchical regression results for the initial level of difficulty chosen

| | Initial level of difficulty chosen | |
|---|---|---|
| | Beta | $\Delta R^2$ |
| Block 1 | | .35*** |
| Instruction (−1 = ego-involving, +1 = task-involving) | .01 | |
| Gender (−1 = female, +1 = male) | .18* | |
| Instruction × gender | −.18* | |
| Problem 1 feedback | .50** | |
| Block 2 | | .08* |
| Instruction | −.01 | |
| Gender | .12 | |
| Instruction × gender | −.13 | |
| Problem 1 feedback | .44*** | |
| Mastery-approach goal | .09 | |
| Mastery-avoidance goal | .07 | |
| Performance-approach goal | .25* | |
| Performance-avoidance goal | −.30** | |

* $p < .05$, ** $p < .01$, *** $p < .001$; $N = 111$

**Table 3** Hierarchical regression results for analysis of average level of difficulty selected for early trials (1–5) and later trials (6–10)

| | Average difficulty for early trials | | Average difficulty for later trials | |
|---|---|---|---|---|
| | Beta | $\Delta R^2$ | Beta | $\Delta R^2$ |
| Block 1 | | .17*** | | .18*** |
| Instruction (−1 = ego-involving, +1 = task involving) | −.02 | | −.19† | |
| Gender (−1 = female, +1 = male) | .20* | | .32*** | |
| Instruction × gender | −.05 | | .05 | |
| Problem 1 feedback | .33*** | | .20* | |
| Block 2 | | .16*** | | .14*** |
| Instruction | −.04 | | −.16† | |
| Gender | .10 | | .24** | |
| Instruction × gender | .01 | | .08 | |
| Problem 1 feedback | .27** | | .14 | |
| Mastery-approach goal | .24* | | .34** | |
| Mastery-avoidance goal | .01 | | −.11 | |
| Performance-approach goal | .32** | | .21† | |
| Performance-avoidance goal | −.34** | | −.11 | |

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; $N = 111$

The analysis for the later trials (Table 3) indicated that the achievement goals accounted for an additional 14% of the variance when added in block 2. However, in this case only the mastery-approach goal was statistically significant, although the performance-approach goal was marginally significant ($p < .08$). Consistent with Hypothesis 8, performance avoidance did not have a significant relationship with the average level of difficulty selected in the later trials. In order to formally test Hypothesis 8, we used a procedure described in Cohen et al. (2003, see Appendix 2, p. 642) which can be used to test the change in a beta weight when different dependent variables are examined with the same set of predictors. This test indicated that the relationship of performance avoidance goals to the average level of difficulty chosen was significantly greater when predicting choices on the early trials than the later trials, $t(102) = 4.00$, $p < .001$, $\Delta R^2 = .11$.

### Gender and perceived ability and choice of difficulty level

Hypothesis 9, which predicted that women would report lower levels of perceived ability than men, was supported [$t(108) = 4.97$, $p < .001$, $d = 1.02$, $M$s $= 4.45$ for men and 3.57 for women]. In addition Hypothesis 10 predicted that women would select lower levels of difficulty than men on the early and later trials. The analysis of initial level of difficulty chosen had indicated that women selected a lower level of difficulty than men only in the ego-involving condition. Both the correlations displayed in Table 1 and the HLM analysis support the fact that women generally selected lower levels of difficulty than did men across the early and later trials.

## Discussion

Our goal in conducting this study was to investigate the relationship between achievement goals and risk-taking behavior. Early achievement motivation studies had investigated risk-taking behavior by examining the level of task difficulty individuals chose as a function of their motives. Individuals high in need for achievement were predicted to prefer moderate difficulty while those high in fear of failure were predicted to prefer very easy or very hard tasks (Atkinson 1957). Studies testing these predictions often used ego-involving conditions to arouse the motives; however, the focus was more on individual differences than the influence of variations in situations. In contrast to this, Nicholls (1984) suggested that the nature of the situation could lead individuals to adopt different types of goals that would influence their preferences for task difficulty levels. In ego-involving conditions, individuals would be most likely to adopt performance goals with the aim of demonstrating high normative ability or avoiding the demonstration of low normative ability. Those with confidence in their ability were predicted to prefer moderate to high difficulty levels with the expectation of demonstrating high ability. Those with doubts about their ability might select very high levels of difficulty or low levels of difficulty to avoid demonstrating low ability. In conditions which de-emphasize social comparison and performance evaluation and attempt to get the individual focused on the task at hand, mastery goals are more likely to be adopted with an emphasis on demonstrating ability through improvement. In these more neutral or ideally task-involving conditions, individuals will be more likely to prefer moderate levels of difficulty.

In our study, the initial difficulty level selected by those given neutral instructions was moderate. After ego-involving instructions, men were more likely to initially prefer a higher level of difficulty and women were more likely to prefer a lower level of difficulty. Our post-experimental measure of perceived ability revealed the predicted gender difference with men rating their ability higher than women. Consequently the men might have been more confident of their abilities which, based on Nicholls' prediction, would lead to the selection of moderate to high difficulty levels in ego-involving conditions. The women, being less confident, selected a somewhat lower level of difficulty, again consistent with Nicholls' prediction. Thus the general pattern of initial level of difficulty chosen was consistent with Nicholls' (1984) predictions.

We had originally hoped to induce task involvement in the neutral instruction condition. However, individuals in that condition did not endorse mastery goals at a higher level than individuals in the ego-involving condition. Our experimenters were instructed not to be evaluative in their interactions with participants, but the fact that they were giving correct/incorrect feedback in the neutral condition probably made that condition somewhat evaluative. Both the presence of the experimenter and the feedback may have interfered with getting absorbed in the task. We did succeed in minimizing evaluation concerns in the neutral condition, as those in the ego-involving condition endorsed performance-avoidance goals more strongly than participants in the neutral condition. When examining early research on risk-taking behavior, Nicholls (1984) did find several studies in which the experimental conditions could be classified as more neutral than task-involving. Nevertheless, even in the neutral conditions he still found a general preference for moderate difficulty. Thus, the instructional manipulation in this study did have an effect consistent with Nicholls' predictions and past research. It probably would have been a stronger effect if we had been

able to induce greater task involvement. Others have noted the difficulty in manipulating task involvement (e.g., Butler 1993).

During the early trials we did observe a general trend for participants to prefer higher levels of difficulty, consistent with previous research (e.g., Slade and Rush 1991). However, there was also a curvilinear trend for men in the ego-involving condition and women in the neutral condition. Within gender, each of these groups started at a somewhat higher level of difficulty than the same gender group receiving the contrasting instruction (e.g., men in the ego-involving condition started somewhat higher than men in the neutral condition). It may be that individuals starting at a higher level of difficulty selected several more problems at that level to ensure success before moving on to a higher level. Replicating the observations of Slade and Rush (1991), we found that the relationship between trial number and level of difficulty selected flattened out on the later trials.

An unexpected result of the instructional manipulation was the somewhat higher level of difficulty selected by participants in the ego-involving condition on the later trials. Typically, achievement goal experiments which manipulate task- and ego-involving instructions find detrimental effects of ego involvement (e.g., Butler 1999; Graham and Golan 1991). The results of the present study suggest that across time, the detrimental effects of ego involvement on performance may give way to positive effects. Future research should further investigate changes across time in reactions to ego-involving instructions.

There are some important ways in which this study differs from prior experiments which may help explain the surprising finding. A major difference is that in this experiment participants were allowed to choose the problems they worked on. In this free choice context, the ego-involving instructions seemed to be motivating in the sense that participants pushed themselves to select higher levels of difficulty. Yet participants were also free to control their overall performance (number of items correctly answered) by selecting lower levels of difficulty if they were not succeeding at a higher level. The goal of participants in the neutral condition was to develop their skills at solving the problems. These participants may have spent more time ensuring that they had mastered a given level of difficulty before trying a higher level. In contrast, the goal of the participants in the ego-involving condition was to demonstrate high ability. This goal could be attained by successfully solving more difficult problems. This experiment is also different from some past studies in that choices are examined across time. The positive influence of the ego-involving instructions appears near the end of the study.

Recent developments in achievement goal theory led us to predict different relationships between the average level of difficulty selected and the different types of achievement goals. We had expected the approach goals to relate positively to the average level of difficulty selected and performance avoidance to relate negatively. Because the goals were not measured before task engagement, they could have been influenced by performance. Thus, we can only discuss the relationships observed and cannot imply that the adoption of the different goals caused the participants to choose higher or lower difficulty levels. Although there were no group differences in the number of problems correctly solved, there were differences in the average level of difficulty selected. We did find that the approach goals related positively to the average level of difficulty selected on earlier (1–5) and later (6–10) trials. Furthermore, performance avoidance was negatively related to the average level of difficulty selected on earlier trials. We had expected this latter relationship to be stronger in the ego-involving condition, but the effect was not moderated by the instructional condition. Had we been successful in inducing task involvement perhaps the relationship with performance avoidance would have been weaker in the task-involving condition. Consistent with the predictions of the dynamics of action, the negative relationship between performance avoidance and level of difficulty chosen declined in the later trials. Thus, over time level of difficulty chosen was less strongly related to the avoidance tendency. This effect may have been partially a function of the free choice nature of the study. Participants did select the problems so as to maintain a relatively positive performance level ($M = 7.15$ problems correct) and their total score was unrelated to the achievement goals. Another possibility is that the anxiety of individuals who endorsed performance-avoidance goals may have decreased as they spent more time with the task.

Although we observed generally positive relationships between the performance-approach goals and level of difficulty chosen, past research has found performance-approach goals to be related to maladaptive study strategies (Kaplan and Midgley 1997; Meece et al. 1988; Nolen 1988; Ravindran et al. 2005) and to avoidance of help seeking (Ryan and Pintrich 1997). This pattern is consistent with the idea that individuals with performance-approach goals take the quickest route to demonstrating superior performance. If simply memorizing material can lead to a good grade then that approach will be adopted. Such a strategy may not work as well for a mastery-focused individual whose goal is learning and understanding. In the current study, individuals in the neutral instruction condition may have felt less compelled to push themselves to try higher levels of difficulty and were more likely to focus on moderate difficulty which they found challenging. Even so, performance-approach goals related positively to the level of difficulty chosen regardless of the instructional

manipulation, suggesting this relationship was independent of the effects of the situation.

We did not have firm hypotheses about the mastery-avoidance goal. In general this goal did not relate to the levels of difficulty chosen in this study. As can be seen in Table 1, the endorsement of mastery-avoidance goals was strongly correlated with the other achievement goals, but not with the levels of difficulty chosen. Thus this goal may be somewhat redundant with mastery-approach and performance-avoidance goals. Future research should continue to explore the situations in which this goal may add to our understanding of motivational effects.

Our hypotheses about gender differences were confirmed. In general, women reported lower perceived ability and selected lower levels of difficulty than did men. These results are consistent with prior studies (e.g., Sorrentino et al. 1992) and reinforce the concerns that women's lower self-assessments and confidence may lead to lower expectations and hence an unwillingness to take chances (Hyde and Kling 2001). One alternative explanation for the gender differences observed is that the types of problems presented here may have induced a stereotype threat. A study by Spencer et al. (1999) demonstrated a stereotype threat effect for math problems when the experimenter did not address gender differences in performance of the problems. The assumption was that participants were aware of the stereotype that men are better at math than women. This effect disappeared when participants were informed that in the past men and women performed similarly on the test. Some of the problems in the current study involved spatial abilities which tend to favor men and may have contributed to a stereotype threat effect. Future research could examine choice of difficulty levels when the task is presented as favoring women or when participants are informed that no gender differences have been found in performance on the problems.

There are several limitations of this study. It would have been preferable to measure the achievement goals at the beginning of the study; however we were concerned about priming participants in the neutral condition with statements concerning how their performance compares to that of others. This limits the conclusions that can be drawn about the correlations between the personally endorsed achievement goals and level of difficulty chosen because we don't know if the endorsement of the achievement goals would have been different if assessed before the task. However, the observed relationships are consistent with our predictions. In addition the number of problems solved correctly did not vary as a function of condition, gender or endorsement of achievement goals nor did the relationship between feedback and level of difficulty chosen across trials depend on the instructional condition or gender. It would also have been better if the neutral instruction had resulted in a stronger mastery focus, but the presence of the experimenter may have interfered somewhat with the development of task involvement. Had we been able to induce task involvement perhaps we would have seen more risk taking behavior in the neutral condition. This is an issue that could be addressed in future research.

Future research should also investigate the potential positive effects of ego-involving instructions observed in this study. One question concerns whether or not this effect would occur if the problems had been assigned rather than chosen. Another question concerns whether performance-avoidant participants would perform better if they were given a fairly long practice session which might reduce the impact of their anxiety. Considering that choice of difficulty on the later trials was not related to performance avoidance, maybe the anxiety of the participants decreased over time.

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