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ABSTRACT

Currently there is a debate about the types of achievement goals that promote optimal motivation. A number of theorists argue for a "mastery" goal perspective focusing on the adaptive consequences of mastery goals and the maladaptive consequences of performance goals. Others endorse a "multiple" goal perspective in which both mastery and performance goals can be beneficial. The purpose of this study was to provide a comprehensive test of the mastery versus multiple goal perspective. In study 1, a correlational approach was used to identify the optimal goals for 166 undergraduates to adopt for a learning activity. In study 2, which involved 154 undergraduates, an experimental approach was used to identify the optimal goals to assign for the same activity. Each study reveals benefits of both mastery and performance goals, providing support for a multiple goal perspective. (Contains 6 tables, 5 figures, and 66 references.) (Author/SLD)

Running head: ACHIEVEMENT GOALS

Achievement Goals and Optimal Motivation:
Should We Promote Mastery, Performance, or Both Types of Goals?

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Abstract

Currently, there is a debate about which types of achievement goals promote optimal motivation. A number of theorists argue for a "mastery" goal perspective focusing on the adaptive consequences of mastery goals and the maladaptive consequences of performance goals. Others endorse a "multiple" goal perspective in which both mastery and performance goals can be beneficial. The purpose of the present investigation was to provide a comprehensive test of the mastery vs. multiple goal perspectives. In Study 1, a correlational approach was employed to identify the optimal goals for college participants to adopt for a learning activity. In Study 2, an experimental approach was employed to identify the optimal goals to assign for the same activity. Each study revealed benefits of both mastery and performance goals, providing support for a multiple goal perspective.

Achievement Goals and Optimal Motivation:

Should We Promote Mastery, Performance, or Both Types of Goals?

Most instructors hope that their students will become interested in their coursework and perform at a high level. But how can both educational outcomes be achieved? Are there particular types of goals our more successful students are adopting? Are there particular types of goals that we can assign to our students?

Over the past two decades, achievement goal theory has emerged as the predominant framework for understanding achievement motivation (Midgley et al., 1998; Pintrich & Schunk, 1996). Achievement goals reflect the purpose of an individual's achievement pursuits (Maehr, 1989; Midgley et al., 1998), and two general types of achievement goals have been proposed (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1984): mastery and performance.[1] When pursuing mastery goals, an individual's purpose is to develop competence by acquiring new knowledge and skills (e.g., "My goal in this class is to learn as much as I can about the topic"). When pursuing performance goals, an individual's purpose is to demonstrate competence relative to others (e.g., "My goal in this class is to do better than other students"). Thus, individuals can be motivated to achieve for two very different reasons – to increase their competence by learning as much as they can about a topic or to gain favorable judgments of their competence by performing as well as they can compared to others.

Because mastery and performance goals represent different ways of thinking about competence, theorists argue these goals will create a framework for how individuals approach, experience, and react to achievement situations (Ames & Archer, 1988; Dweck & Leggett, 1988; Nicholls, 1984). For example, Dweck and Leggett (1988) posited that, when entering an activity with a mastery goal, individuals strive to improve and develop their skills. Effort is viewed as a key component of success, and individuals should therefore seek out challenge and persist despite making mistakes or facing difficulty. In contrast, when pursuing a performance goal, individuals are concerned with how their ability compares to others and may avoid challenge because it threatens the possibility of demonstrating high levels of ability. In addition, when performance difficulties are encountered, individuals may withdraw or give up rather than risk continued failure. In this case, putting forth effort can signal that one lacks ability. However, as long as performance-oriented individuals are performing well or perceive themselves as competent, adaptive behaviors should be displayed. Thus, Dweck and Leggett proposed that mastery goals are more likely to foster an adaptive pattern of achievement, whereas performance goals are at risk of promoting a maladaptive pattern.

In an influential review of the achievement goal literature, Ames (1992) noted considerable benefits of pursuing mastery goals over performance goals. For example, students pursuing mastery goals select more challenging tasks, persist in the face of difficulty, use deeper, more elaborate study strategies, and hold more positive attitudes toward learning (e.g., Ames & Archer, 1988; Elliott & Dweck, 1988; Meece, Blumenfeld, & Hoyle., 1988; Nolen, 1988). In contrast, students pursuing performance goals choose easier tasks, engage in more superficial or strategic learning strategies, and withdraw effort when difficulty is encountered. Thus, Ames concluded that a mastery goal orientation promotes long-term and high-quality involvement in learning, and advocated external interventions that would encourage students' adoption of mastery goals and minimize their adoption of performance goals. The assumption that mastery goals are adaptive and performance goals are maladaptive will be referred to as the <u>mastery goal perspective</u> because it implies that individuals are best off exclusively focusing on mastery in their achievement pursuits (cf. Spence & Helmreich, 1983).

Although little debate exists about the positive consequences of pursuing mastery goals, others disagree with a strict mastery goal perspective, and suggest instead that performance goals can also promote important educational outcomes. For example, Wentzel (1991) found that what distinguished high school students with lower GPAs from those with higher GPAs was not their less frequent pursuit of mastery goals, but their failure to pursue performance goals as well. Thus, a number of theorists endorse a <u>multiple goal perspective</u> in which adopting both types of achievement goals is considered most adaptive (Butler & Winne, 1995; Ford, 1992; Harackiewicz, Barron, & Elliot, 1998; Pintrich & Garcia, 1991; Wentzel, 1991). Indeed, more recent reviews of the achievement goal literature suggest that strong conclusions about the negative effects of performance goals may be premature (Harackiewicz, et al., 1998; Hidi & Harackiewicz, in press; Rawsthorne & Elliot, in press; Urdan, 1997).[2] It is also important to note that none of these theorists argue <u>against</u> mastery goals, and thus the critical difference between these two perspectives concerns the effects of performance goals.

<u>Evaluating the Mastery Goal and Multiple Goal Perspectives</u>

Why have these two competing perspectives emerged? First, despite the numerous correlational and experimental investigations conducted to date, one issue to consider is whether a particular study employed a methodology that allows a fair test of both perspectives. For example, in experimental studies, participants have only been asked to work under a mastery or a performance goal, where the single goal is assigned or suggested to participants (e.g., Elliot & Dweck, 1988; Graham & Golan, 1991; Nichols, Whelan, & Meyers, 1995). Conditions in which both goals are assigned have gone untested. Although experimental investigations typically find that mastery goals do lead to more beneficial outcomes in a wider range of situations than performance goals (Utman, 1997), this approach has prematurely biased our conclusions to supporting the mastery goal perspective. Current experimental work is silent regarding the additional benefits or disadvantages of pursuing a performance goal in conjunction with a mastery goal, and an assumption is being made that individuals pursue and are motivated by one goal or the other. However, until a multiple goal condition is compared to a single mastery goal condition, we can only conclude that pursuing a single mastery goal is more advantageous than pursuing a single performance goal.

In contrast, in correlational studies, students are typically surveyed in classroom settings and asked to indicate the extent to which they pursue each type of goal in their coursework. Instead of finding mastery and performance goals to be negatively correlated (which would suggest that one goal is pursued to the exclusion of the other), most survey studies consistently find that measures of mastery and performance goals are uncorrelated or even positively correlated (see Harackiewicz et al., 1998, for a review). Given the possibility that students can and do pursue multiple goals, it is critical to test the simultaneous effects of mastery and performance goals, as well as test whether mastery and performance goals interact. However, many early correlational studies did not test for both independent and interactive goal effects. When researchers have employed data analytic strategies that do afford a test of both perspectives (e.g., multiple regression, median-split procedures, or cluster analysis), only a few studies have found that optimal achievement outcomes occur when students endorse mastery goals but not performance goals (e.g., Meece & Holt, 1993; Pintrich & Garcia, 1991). A greater proportion have found that optimal outcomes occur when both goals are pursued (e.g., Ainley, 1993; Bouffard, Boisvert, Vezeau, & Larouche, 1995; Elliot & Church, 1997; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997; Harackiewicz, Barron, Tauer, Carter, & Elliot, in press; Wentzel, 1993).

Even when appropriate methodology and data analytic techniques are adopted, a second issue to consider is the pattern of evidence that would support a multiple goal perspective. Although the mastery goal perspective generates a fairly straightforward prediction (mastery goals will have positive effects and performance goals will have negative or null effects), it is less obvious exactly how or why mastery and performance goals might combine to promote educational outcomes. Therefore, a challenge in evaluating the multiple goal perspective is to provide a clear statement of how multiple goal effects might be revealed. For example, in survey studies in which mastery and performance goals are independently assessed, there are at least three patterns of findings that would support a multiple goal perspective, corresponding to three different hypotheses about how multiple goals work together to optimize educational outcomes.

An additive goal hypothesis proposes that mastery and performance goals will have independent, positive effects on a particular educational outcome. Statistical support for this hypothesis would come in the form of positive main effects for both mastery and performance goals on a single outcome measure. In fact, a number of researchers have obtained this pattern of results, finding that both goals have independent, positive effects on such outcome measures as cognitive strategy use, positive attitudes toward a task, and classroom performance (e.g., Archer, 1994; Meece, et al., 1988; Wolters, Yu, & Pintrich, 1996). However, the magnitude of the mastery goal effect has typically been greater and the positive effects of performance goals have been downplayed. Thus, this pattern of evidence can be misinterpreted as support for the mastery goal perspective instead, and overlooked as supporting the multiple goal perspective. Figure 1a presents a hypothetical pattern of data that would support the additive goal hypothesis.

An interactive goal hypothesis proposes that, regardless of their independent effects, mastery and performance goals interact, such that individuals who endorse both goals are notably advantaged in achieving a particular educational outcome. For example, Wentzel (1993) and Bouffard et al. (1995) found that students endorsing both types of goals achieved the highest grades in their courses. Statistical support for this hypothesis would come in the form of a positive Mastery goal X Performance goal interaction. Figure 1b presents a hypothetical pattern of data that would support the interactive goal hypothesis.[3]

A <u>specialized goal hypothesis</u> proposes that, rather than promoting the same achievement outcomes, mastery and performance goals have specialized effects on different outcomes. For example, Harackiewicz et al. (1997; in press) and Elliot and Church (1997) found that students who endorsed mastery goals at the beginning of a semester reported more interest in a course, but that mastery goals were unrelated to students' performance in the course. In contrast, performance goals were unrelated to interest, but did predict higher grades. Thus, the specialized goal hypothesis suggests a benefit of pursuing multiple goals that is only revealed when investigators assess multiple outcomes. Statistical support for this hypothesis would be found by obtaining a positive main effect for mastery goals on one outcome (e.g., interest) and a positive main effect for performance goals on a different outcome (e.g., performance). Figure 1c presents a hypothetical pattern of data that would support a specialized goal hypothesis. In sum, evidence in support of a multiple goal perspective may be revealed in a number of different ways.

A final issue that makes it difficult to draw strong conclusions from existing research concerns a number of additional factors that vary between studies. For example, some researchers conduct experimental studies with college-aged students using puzzle-like tasks, whereas others focus on classroom settings with students ranging from elementary school through college. Any one or some combination of these factors (laboratory vs. field setting, age of participants, or academic vs. nonacademic task) might account for different results across studies. In particular, researchers tend to summarize findings across experimental studies in the laboratory and correlational studies done in the field, but these different research approaches afford different tests of multiple goal effects (as we have already discussed) and research methodology may affect the conclusions drawn.

Another implication of differences in methodology is that most correlational and field studies have been limited to studying the effects of self-set goals, whereas laboratory studies have been limited to studying the effects of assigned goals. Thus, goal origin is confounded with the particular research approach adopted. To examine this issue systematically, it seems critical to examine whether goal effects vary as a function of their origin (self-set vs. assigned) in the same research context. In fact, theorists differ in the extent to which they view achievement goals as reflecting stable personality differences or as situationally determined (Pintrich & Schunk, 1996). If goals are malleable, it may be possible to induce optimal goals with experimental interventions, and we would expect these manipulated goals to have effects comparable to the same goals when freely adopted by students. However, it is not clear that situationally induced goals are directly comparable to self-set goals, or what type of intervention would be sufficient to instantiate a particular goal or pair of goals with the same motivational power as self-set goals. Thus, we need to consider goal origin as another important factor that may determine when particular types of goals are effective.

The Current Research

To offer a critical test of the mastery vs. multiple goal perspectives, correlational and experimental research methods were both employed, and two outcome measures were investigated: interest and performance in a learning activity. In Study 1, college students' self-set achievement goals were measured and evaluated correlationally, and in Study 2, achievement goals were manipulated and evaluated experimentally. To keep everything identical between studies and only vary whether participants' goals were measured or manipulated, a learning activity was devised to recreate a classroom learning experience in a controlled laboratory setting. In addition, previous laboratory investigations have often involved nonacademic tasks (e.g., puzzles or game-like activities), making direct comparisons between laboratory and classroom studies difficult. However, in the current studies, the activity involved teaching college students new techniques for solving math problems to broaden the external validity of laboratory paradigms to include more realistic learning situations.

Moreover, a number of the limitations in previous research that have not permitted a comprehensive test of the mastery vs. multiple goal perspectives were addressed. For example, in the experimental study, a condition in which both goals were assigned was included. In both studies, multiple regression was employed to allow an adequate test of the additive and interactive goal hypotheses, and multiple achievement outcomes were measured to test the specialized goal hypothesis.[4] With these additional steps, we can more thoroughly identify (or rule out) any additional benefits of pursuing multiple goals.

Finally, Dweck and Leggett (1988) predicted that the maladaptive effects of performance goals may only be revealed when difficulty is faced and perceptions of competence are lowered. Thus, it is also important to compare the mastery and multiple goal perspectives under conditions in which participants experience difficulty as well as success with an activity. Accordingly, we also manipulated difficulty with the learning activity in both of the present studies.

Study 1

Method

Participants

One hundred and sixty-six undergraduates (79 males and 87 females) were recruited from an introductory psychology extra credit pool. Gender was used as a blocking variable to control and test for any gender effects.[5] Participants were then randomly assigned to one of two experimental conditions of problem difficulty.

Procedure

Each participant was individually run through the session. Participants first read and signed a consent form that stated that participants would be introduced to new techniques that re-think traditional approaches for solving math problems. The experimenter explained that these techniques involved using new strategies for performing fundamental math operations like addition, subtraction, multiplication, and division and informed participants that this particular session would focus on multiplication. Participants were then asked to use their current math strategies to solve as many multiplication problems as they could in five minutes to obtain a baseline measure of math ability. The problems involved multiplying two-digit numbers together (e.g., 34 x 21). Participants then filled out a questionnaire to obtain a baseline measure of math interest.

An audiotape guided participants through the next part of the session. The tape instructed participants to complete a questionnaire that assessed their achievement goals for the learning session. Next, the tape guided participants through a learning packet that taught the new multiplication strategy. As participants followed along, a narrator on the tape read the full text of the learning packet. This was done to simulate a classroom experience when listening to a lecture and to control the amount of time that participants had to learn the new technique. The technique was based on a program developed by Flansburg and Hay (1994), and involved a strategy to solve two-digit multiplication problems mentally rather than having to rely on more traditional strategies of working out problems with paper and pencil.

The experimenter then administered a follow-up assessment. Once again, participants were asked to solve as many problems as they could in 5 minutes, but they were now instructed to use only the new technique.[6] Two different sets of problems were used in the follow-up test to manipulate difficulty. Half of the participants received a set of problems of similar difficulty to the learning session; the other half received more difficult problems. This was designed to provide one group of participants a success experience when trying to use the new technique (the success condition), whereas the other group would encounter difficulty (the difficulty condition). The experimenter was blind to which problems the participants completed.

The experimenter then informed participants that there was one final questionnaire to complete, but that the experimenter first needed to step out for a moment to get another participant started. This was done to provide an excuse for participants to be left alone in the room for a behavioral assessment of interest. The experimenter told participants that this would take a couple of minutes and that they were welcome to do whatever they wanted while the experimenter was gone, including looking at other mental math techniques, reading a newspaper, or just "hanging out" until the experimenter returned. Provided in the room were a local newspaper, a second learning packet on new techniques for addition, and a copy of Flansburg and Hay's (1994) book on the mental math techniques. During this free-choice period, the participant's behavior was observed through a hidden video camera. After five minutes, the experimenter returned and administered a final questionnaire that contained self-report measures of interest.

Math Technique and Manipulation of Problem Difficulty

The mental math technique is called left-to-right cross multiplication (Flansburg and Hay, 1994). For example, take the problem 34 x 21. Instead of more traditional methods in which we would first start multiplying the numbers on the right side of the equation and then move left (multiplying the ones columns together, 4 x 1 for an initial total of 4), the current method is called "left-to-right" because the problem is started by multiplying the digits on the left side of the equation and then moving right (e.g., multiplying the tens columns together 30 x 20 for an initial total of 600). The purpose of this strategy is to establish in your first calculation a base number that provides a much closer approximation to the final answer (e.g., 600 instead of 4). This initial base number is then committed to memory and updated in a series of three additional calculations. With each additional calculation, the previous base number is revised until arriving at the final answer.

Problem difficulty was manipulated by altering the number of "mental" carries that were required when solving the problem. Specifically, difficulty was operationalized as having to revise or carry numbers to previous hundreds or tens columns in the base number being held in memory. In the difficulty condition, all problems required two or three mental carries. In contrast, in the success condition, problems required only zero, one, or two mental carries.

Measures

Pretest ability and pretest interest. For the baseline measure of math ability (Pretest Ability), both the number of problems attempted and the number of problems correctly solved was recorded. These measures were almost perfectly correlated, $r(166) = .95$, $p < .001$. After completing the pretest ability measure, a self-report measure of math interest was assessed. Ratings on two items (e.g., "I find math enjoyable") were averaged to form an index of initial interest ($\alpha = .90$; Pretest Interest). Participants indicated the extent to which each item was true of them on a 1 (not at all true of me) to 7 (very true of me) scale.

Achievement goals. Three items (e.g., "My goal in this session is to learn as much as I can about this method") were averaged to form an index of mastery goals ($\alpha = .88$, Mastery Goals), and three items (e.g., "My goal is to be able to solve more problems than other students") were averaged to form an index of performance goals ($\alpha = .86$, Performance Goals). Participants indicated the extent to which each item was true of them on a 1 (not at all true of me) to 7 (very true of me) scale. Items were adapted from surveys used in recent goal research conducted in college classroom settings (Barron, Schwab, & Harackiewicz, 1999; Harackiewicz et al., 1997).

Interest. Three measures of interest were collected. First, a behavioral measure consisted of the number of seconds that participants looked at additional information on new math techniques during the 5-minute free-choice period (Freetime). Second, participants' ratings on five items from the final questionnaire (e.g., "The learning session on the new technique was interesting") were averaged to form a self-report measure of task enjoyment ($\alpha = .89$, Enjoyment). Participants indicated the extent to which they agreed with each item on a 1 (strongly disagree) to 7 (strongly agree) scale. Finally, one item ("Did your experience today make you want to learn about more advanced mental math techniques for multiplication? Yes/No") provided a measure of behavioral inclination (Inclination). Similar measures have been used successfully in previous intrinsic motivation research (Harackiewicz & Elliot, 1993; Harackiewicz & Elliot, 1998).

Manipulation Check of Perceived Difficulty. At the end of the session, one additional question, "I think I did well using the new technique," was measured to test whether the difficulty manipulation was successful in lowering perceptions of competence. Participants indicated the extent to which they agreed with the item on a 1 (strongly disagree) to 7 (strongly agree) scale.

Performance. As in the pretest measure, both the number of problems attempted and the number of problems correct were recorded. Again, these two measures were almost perfectly correlated, $r(166) = .96$, $p<.001$. Because participants were never provided explicit feedback about how many problems they correctly solved, the number of problems attempted (Problems Attempted) will be used as the more salient performance measure for participants. Participants had a clear idea of how many problems they attempted, especially in relation to the number of problems they attempted with their old technique. Analyses on the number correct (Problems Correct) were also conducted and any differences will be footnoted.

Results

Descriptive and Correlational Analyses

The means, standard deviations, and possible range for variables measured in Study 1 are reported in Table 1 and correlations are reported in Table 2. On average, participants were more likely to adopt mastery goals ($M = 4.97$; $SD = 1.23$) than performance goals ($M = 4.20$; $SD = 1.40$), and the correlation between mastery and performance goals suggests that, rather than focusing on one goal to the exclusion of the other, participants who adopted mastery goals also were more likely to adopt performance goals for the session, $r(166)= .31$, $p<.05$.

Manipulation Check

To verify that the manipulation of difficulty was successful, two t-tests were performed to look at both behavioral differences in actual performance when using the new technique as well as the psychological implications on participants' perceived competence. Participants in the difficulty condition ($M = 13.72$; $SD = 5.25$) did in fact solve fewer problems than participants in the success condition ($M = 26.04$; $SD = 8.18$), $t(164) = 11.48$, $p < .001$. Furthermore, participants in the difficulty condition ($M = 3.63$; $SD = 1.36$) reported lower levels of perceived competence with the technique than participants in the success condition ($M = 4.92$; $SD = 1.47$), $t(164) = 5.87$, $p < .001$.

Overview of Regression Analyses

Multiple regression was used to investigate the effects of the predictor variables on interest and performance outcomes with the new math technique. The basic model tested on each outcome included the main effects for mastery goals (measured continuously), performance goals (measured continuously), difficulty (-1 success, +1 difficulty), and gender (males –1, females +1). In addition, main effect terms were standardized, and a series of interaction terms were created to test for all possible two- and three-way interactions (Aiken & West, 1991). Finally, two covariates were included, to control for initial differences in math ability and interest. None of the three-way interactions approached significance in preliminary models, so they were dropped from the final model. Thus, the final model included 12 terms: 4 main effect terms, 6 two-way interaction terms, and 2 covariates (Pretest Ability, Pretest Interest). To interpret significant interactions, predicted values were calculated according to the guidelines set forth by Aiken and West (1991).

Interest Analyses

Regressing Freetime on the final model revealed significant main effects for Mastery Goals, $\underline{F}(1, 153) = 6.56$, $\underline{p}<.05$ (B = .22), and Gender, $\underline{F}(1, 153) = 8.64$, $\underline{p}<.01$ (B = -.23). Participants reporting higher levels of mastery goals spent more time looking at additional information about the new math technique during the free-choice period. In addition, males were more likely than females to look at additional information.

Regressing Enjoyment on the final model revealed significant main effects for Mastery Goals, $\underline{F}(1, 153) = 24.22$, $\underline{p}<.001$ (B= .39), Difficulty, $\underline{F}(1, 153) = 14.28$, $\underline{p}<.001$ (B = -.26), and Pretest Interest, $\underline{F}(1, 153) = 4.19$, $\underline{p}<.05$ (B = .15). Participants reporting higher levels of mastery goals indicated more enjoyment. Participants also enjoyed the session more when they were in the success condition than when they were in the difficulty condition, and enjoyed the session more when they had higher levels of initial interest in math.

Regressing Inclination on the final model revealed significant main effects for Mastery Goals, $\underline{F}(1, 153) = 14.43$, $\underline{p}<.001$ (B = .31), and Gender, $\underline{F}(1, 153) = 12.02$, $\underline{p}<.001$ (B = -.26). Participants reporting higher levels of mastery goals indicated a greater inclination and desire to want to learn about additional mental math techniques, and males indicated more inclination than females.

Performance Analyses

Regressing Problems Attempted on the final model revealed significant main effects for Pretest Ability, $\underline{F}(1, 153) = 49.50$, $\underline{p}<.001$ (B= .34), Gender, $\underline{F}(1, 153) = 18.86$, $\underline{p}<.001$ (B = -.21), and Difficulty, $\underline{F}(1, 153) = 186.10$, $\underline{p}<.001$ (B = -.64). Participants higher in the pretest ability solved more problems in the follow-up assessment, and males solved more problems than females.

Participants also solved more problems in the success condition than in the difficulty condition, as already noted in the manipulation check analyses.

In addition, a nearly significant main effect of Performance Goals, $F(1, 153) = 3.71$, $p<.06$ ($B = .10$), suggested that participants who endorsed performance goals solved more problems than participants who endorsed lower levels of performance goals. This effect was qualified by a significant Performance Goals X Difficulty interaction, $F(1, 153) = 4.82$, $p<.05$ ($B = -.11$). In the success condition, participants adopting performance goals ($\hat{Y} = 27.76$) attempted more problems than participants with lower levels of performance goals ($\hat{Y} = 23.75$). However, in the difficulty condition, performance goal adoption had no relationship to the number of problems attempted. Participants adopting higher levels of performance goals ($\hat{Y} = 13.76$) attempted a similar number of problems as participants with lower levels of performance goals ($\hat{Y} = 13.92$). However, no negative effects of performance goals and difficulty were revealed.[7] In Figure 2, results for interest and performance outcomes are summarized in a path diagram.

Discussion

In Study 1, participants indicated their level of mastery and performance goal adoption for learning a new technique in math, and we found that self-set mastery and performance goals were each linked to distinct, positive outcomes for the learning session. Mastery goals were the only predictor of interest in the math activity, and performance goals (qualified by an interaction with difficulty) were the only predictor of performance in the math activity. Mastery goals had no effects on performance, and performance goals had no effects on interest outcomes. Furthermore, there were no interactions of mastery and performance goals on any outcome. Finally, problem difficulty did not interact with achievement goals to reveal any negative effects of pursuing performance goals or additional benefits of pursuing mastery goals when faced with difficulty.

These results suggest that both types of achievement goals can be advantageous, and they support a multiple goal perspective. In particular, because each goal was positively associated with a unique achievement outcome (i.e., each goal had a positive main effect on different measures), support for the specialized goal hypothesis was obtained. If multiple outcomes had not been included to allow a test of the specialized goal hypothesis, we would have arrived at a quite different conclusion. If interest was the only outcome assessed, we would have inferred support for the mastery goal perspective. If performance was the only outcome assessed, we would have reported a lack of support for either the mastery goal or multiple goal perspectives, and concluded that simply pursuing performance goals can be beneficial, at least when the level of difficulty encountered was similar to the success condition.

In sum, because mastery goals were the only goals positively linked to interest outcomes and performance goals were the only goals positively linked to performance outcomes, participants who adopted both goals were more likely to become interested and perform well in the learning session. This pattern of findings replicates a similar pattern found in a number of naturalistic studies of college classrooms over the course of the semester (e.g., Barron et al., 1999; Elliot & Church, 1997; Harackiewicz et al., 1997; in press). Moreover, the current results extend these findings from naturalistic studies by suggesting that the benefits of endorsing both goals can also be found in a more immediate time frame, a single 45 minute learning session.

Study 2

If self-set mastery and performance goals have specialized effects as found in the controlled laboratory setting of Study 1 (as well as naturalistic studies of learning in college classrooms), can we obtain similar results by recommending that students pursue both goals? Specifically, can we promote interest in an activity by assigning a mastery goal, and can we promote performance by assigning a performance goal? And, can we promote both outcomes by simultaneously assigning both goals? In Study 2, goals were manipulated experimentally to compare the effects of assigning a single mastery goal, a single performance goal, and both goals for the learning session. The inclusion of the multiple goal condition provides a critical test of the multiple goal perspective that has been neglected in previous experimental work. In other words, we could now test to see if the multiple condition promoted better outcomes than a single mastery goal condition.

However, as noted in the introduction, it is not clear whether achievement goals will lead to similar effects when they are assigned as opposed to self-set. In other words, does the origin or source of a goal moderate its effect? Harackiewicz and Sansone (1991; Sansone & Harackiewicz, 1996) proposed a process model that draws an important distinction between the goals that are suggested or implied by external factors and the goals that are actually adopted by an individual in a particular situation (the perceived goal; see Figure 3). They argued that, rather than assume a one-to-one correspondence between assigned goals and perceived goals, we need to recognize that the goals an individual adopts in a given situation can have multiple determinants. These effects are represented as A paths in Figure 3. One type of determinant involves contextual factors, such as an experimental manipulation in a laboratory setting or a particular characteristic of a classroom setting. For example, in classes that emphasize improvement, students may be more likely to endorse mastery goals (Midgley, Anderman, & Hicks, 1995). A second important determinant involves personality factors, such as achievement orientation. For example, Elliot and Church (1997) and Harackiewicz et al. (1997) found that individual differences in achievement orientation predicted adoption of mastery and performance goals in college courses.

Harackiewicz and Sansone (1991) also suggested that, in addition to being a determinant of goals, contextual and personality factors can play a critical role in moderating the impact of perceived goals on intrinsic motivation. Thus the direct effect of perceived goals on intrinsic motivation, the B path, can vary as a function of contextual or personality factors (represented as a B_A effect in Figure 3). In other words, the B effect is moderated by A. For example, mastery goals might be particularly beneficial for individuals who do not typically value or pursue competence. Whether personality factors function as a determinant of goals or as a moderator of goal effects may depend on the origin of the achievement goal. When goals are self-set (as in Study 1), the perceived goals for the learning session are directly assessed, and we would not expect individual differences to moderate the effects of these goals. Indeed, Harackiewicz et al. (1997) found that achievement orientation predicted goal adoption in a college class, and in turn that goal adoption predicted interest and performance in the classroom. Achievement orientation and goals did not further interact to predict outcomes.

However, when goals are suggested by an external source (as in Study 2) personality factors may play a critical moderating role. For example, in an experimental study with college students, Harackiewicz and Elliot (1993) found that individual differences in achievement orientation moderated the effects of experimentally assigned mastery and performance goals on intrinsic interest. Participants low in achievement orientation (LAMs) became more interested in the activity when assigned a mastery goal; participants high in achievement orientation (HAMs) became more interested when assigned a performance goal. Thus, no one single goal was optimal in promoting interest for all participants.

In explaining this pattern, Harackiewicz and Elliot (1993) posited that HAMs characteristically enter activities with a desire to increase their competence and exceed their previous performance (Atkinson, 1974; McClelland, 1961), and that assigning a mastery goal may not add much to what they normally bring into the situation. Assigning a performance goal, however, provides HAMs the additional challenge and excitement of outperforming others, and thus may be the basis for their increase in interest in the activity under this condition (see also Tauer & Harackiewicz, 1999). In contrast, Harackiewicz and Elliot argued that individuals low in achievement orientation characteristically avoid normative comparisons and are likely to experience performance anxiety in achievement settings (Atkinson, 1974), and thus assigning a performance goal may in fact undermine their interest. However, assigning a mastery goal may help LAMs to better appreciate the development of their competence in the activity and may be the basis for their increase in interest in the activity under this condition.

These findings suggest that experimentally manipulated achievement goals may be differentially effective in promoting achievement outcomes depending on participants' achievement orientation, and raises the intriguing question of how achievement orientation might moderate interest when mastery and performance goals are simultaneously assigned (i.e., under a multiple goal manipulation). How will LAMs and HAMs perceive a pairing of their optimal and less optimal goals? Participants in a multiple goal condition may be particularly advantaged because they can choose to focus on the goal ideally suited for them, and we will refer to this possibility as the selective goal hypothesis. In other words, assigning both goals may be optimal, because participants have the opportunity to select or choose the goal that will best motivate them. When individuals have the option of pursuing multiple goals, they may be better able to negotiate their learning experiences by focusing on the achievement goal that is most relevant for maintaining their motivation at a particular time. For example, LAMs could focus on a mastery goal for the activity, whereas HAMs could focus on a performance goal. Thus, an overall benefit of assigning multiple goals to LAMs and HAMs would be revealed, not because both goals were simultaneously pursued, but because individuals selectively focused on particular goals.

Yet, if both goals are simultaneously pursued, another possibility is that the pairing of goals will mute the impact of the single optimal goal. In the case of LAMs, providing a performance goal along with a mastery goal may be distracting because the task-focusing benefits of a mastery goal (the optimal goal) might be undermined by the performance goal (the less optimal goal). Alternatively, pairing both goals may actually offset the negative effects of the less optimal goal.

LAMs may not be as adversely affected by a performance goal when it is accompanied by a mastery goal. Thus, the multiple goal condition may not result in the best outcomes overall for LAMs and HAMs, but reveal an intermediate advantage. In other words, assigning multiple goals may be more advantageous than assigning the single, less optimal goal, but not as advantageous as assigning the single, optimal goal.

To understand why mastery and performance goals can both foster interest, Harackiewicz and Sansone (1991) proposed that one must consider the motivational variables that underlie the process (C and D paths in Figure 3). In particular, they argued that three variables are the more proximal mechanisms (i.e., mediators) behind the development of intrinsic motivation. These variables are competence valuation, task involvement, and perceived competence. Interest in an activity can result from placing greater importance on developing competence (i.e., competence valuation), becoming absorbed while engaged in the activity (i.e., task involvement), or gaining a sense of efficacy (i.e., perceived competence). Furthermore, they argued that different contextual and personality factors can interact with perceived goals to influence these processes (These effects are represented as a C_A effect in Figure 3).

In Study 2, an experimental approach was taken to identify the optimal achievement goals to assign to participants learning the new math technique. In the beginning of the session, participants were randomly assigned to learn the new technique under one of three goal conditions (mastery goal only, performance goal only, or both goals). Problem difficulty was once again manipulated. Thus, a 3 (mastery goal vs. performance goal vs. multiple goal) x 2 (difficulty vs. success) design was tested. Process measures were collected before and after learning the new technique, and the same outcome measures assessed in Study 1 were also measured in Study 2.

Method

Participants

One hundred and fifty-four university undergraduates (76 males and 78 females) were recruited from an introductory psychology extra credit pool. As in Study 1, participants were blocked on gender. In addition, they were also blocked on achievement orientation. Participants were then randomly assigned to one of the six experimental conditions.

Procedure

The procedure in Study 2 was identical to the one employed in Study 1 with three exceptions. First, instead of providing instructions to complete a goal questionnaire, the audiotape now provided one of the three goal manipulations. The goal manipulations were modeled after the research and conceptual definitions offered by Elliot and Dweck (1988), Ames and Archer (1988), and Butler (1992). Participants assigned the mastery achievement goal were instructed that the purpose of the session was to teach them a new way of doing math. They were also told to adopt a "learning" goal as that went through the session and to focus on how the new techniques could help them develop and improve their math skills. Participants assigned the performance achievement goal were instructed that the purpose of the session was to evaluate how well students could perform math problems using a new way of doing math. They were also told to adopt a "performance goal" as they went through the session, and to focus on how the techniques can aid them in performing well and in solving more math problems than other students. Participants assigned both goals were given both sets of instructions.[8] To ensure that the experimenter running the session was blind to the goal condition, participants listened to the tape using headphones.

Second, process measures were collected immediately after the goal manipulation as well as later in the session. The first process questionnaire assessed competence valuation and anticipated competence. This questionnaire also included a manipulation check to verify whether participants understood the goal manipulation for the session.[9] The second process questionnaire assessed participants' task involvement.

Third, to provide a stronger test of Dweck and Leggett's prediction that performance goals will have negative effects when difficulty is experienced, problem difficulty and explicit feedback were paired together to strengthen the impact of the difficulty manipulation. While participants completed the second process measure, the experimenter filled out a feedback form indicating the progress participants had made in meeting the assigned goal(s) for the session. Participants tested with the success problems received feedback that they were succeeding; whereas participants tested with the more difficult problems received feedback that they were experiencing difficulty.

Measures

The baseline, achievement outcome, and manipulation check measures used in Study 2 were identical to those used in Study 1. However, in Study 2, additional measures were added to investigate potential moderators and mediators of assigned goal effects.

Achievement orientation. The 16-item Achievement Orientation subscale of the Personality Research Form (PRF; Jackson, 1974) was administered several weeks before the session as part of a larger survey, and was included as a potential moderator variable of achievement goal effects when goals are assigned. The scale was developed in accordance with Murray's (1938) theory of needs and conceptualizes achievement motivation as a broad, unitary construct in which individuals strive for excellence out of a desire to work hard, to seek challenge, and to outperform others. Numerous studies have attested to the PRF's reliability and validity (e.g., Anastasi, 1982; Fineman, 1977).

Process Measures. Competence Valuation ("How important is it for you to do well in today's session") and Anticipated Competence ("How confident are you that you'll be able to do well today") were assessed on 1 (not at all important/confident) to 7 (very important/confident) scales. Ratings on five items (e.g., "I got really absorbed in using the new technique") were averaged to form a self-report measure of task involvement ($\alpha = .71$, Involvement). Participants indicated the extent to which they agreed with each item on a 1 (strongly disagree) to 7 (strongly agree) scale. All items were adapted from similar scales used successfully in previous research (see Harackiewicz et al., 1998 for a review).

Results

Descriptive and Correlational Analyses

The means, standard deviations, and possible range for variables measured in Study 2 are reported in Table 3 and correlations are reported in Table 4. At the descriptive level, the means and range of scores were quite comparable to those in Study 1.

Manipulation Checks

As in Study 1, participants in the difficulty condition ($M = 12.42$; $SD = 4.33$) attempted significantly fewer problems than participants in the success condition ($M = 24.35$; $SD = 6.81$), $t(152) = 12.83$, $p < .001$. Participants in the difficulty condition ($M = 2.52$; $SD = 1.17$) also reported significantly lower levels of perceived competence with the technique than participants in the success condition ($M = 5.19$; $SD = 1.04$), $t(152) = 14.99$, $p < .001$. However, in Study 2, the difference on perceived competence was even greater suggesting that the addition of explicit feedback (on whether participants were achieving their assigned goals) did strengthen perceived difficulty in the session, which in turn lowered perceptions of competence with the new method.

Overview of Regression Analyses

As in Study 1, multiple regression was used to investigate the effects of the predictor variables on interest and performance outcomes (the direct effects model). However, in Study 2, analyses were also conducted to test for mediation of these direct effects through process variables assessed throughout the session (the mediational model). The direct effects model tested in Study 2 included the main effects for a pair of orthogonal goal contrasts (Goal Type: mastery goal = -1, multiple goal = 0, performance goal = +1; Multiple Goal: mastery goal = -.5, multiple goal = +1, performance goal = -.5), a difficulty contrast (-1 success, +1 failure), a gender contrast (males –1, females +1), and Achievement Orientation (measured continuously). The goal type contrast tested for a linear effect comparing a single mastery with a single performance goal, with the multiple goal falling in between. The multiple goal contrast, on the other hand, assessed whether the multiple goal condition differed from single goals. In addition, all main effect terms were standardized, and a series of interaction terms were created to test for all possible two- and three-way interactions (Aiken & West, 1991). However, none of the three-way interactions approached significance in preliminary models, so they were dropped from the final model. Finally, two covariates were included to control for initial differences in math ability and interest. Thus, the final direct effects model included 16 terms: 5 main effect terms, 9 two-way interaction terms, and 2 covariates (Pretest ability, Pretest interest).

Direct Effects on Interest

Regressing Freetime on the direct effects model revealed a significant main effect for Pretest ability, $F(1, 137) = 5.43$, $p<.05$ (B = .20), and a nearly significant main effect for Pretest interest, $F(1, 137) = 3.46$, $p<.07$ (B = .15). Participants who displayed higher levels of math ability on the pretest spent more time looking at other mental math techniques during the free-choice period, and participants who had higher levels of Pretest interest in math spent more time returning to the math activity during the free-choice period. In addition, there was a significant Goal Type X Achievement Orientation interaction, $F(1, 137) = 5.07$, $p<.05$ (B = .24). Predicted values for the interaction are reported in Table 5. LAMs were more likely to return to the math activity during the free choice period when assigned mastery goals, whereas HAMs were more likely to return when assigned performance goals. However, when assigned multiple goals, LAMs and HAMs returned to the activity for similar, intermediate amounts of time.

Regressing Enjoyment on the direct effects model revealed a significant main effect for Difficulty, $F(1, 137) = 26.37$, $p<.001$ ($B = -.39$), and two nearly significant main effects for Pretest interest, $F(1, 137) = 3.58$, $p<.06$ ($B = .14$), and Gender, $F(1, 137) = 3.72$, $p<.06$ ($B = .15$). Participants reported more enjoyment in the session when they experienced success rather than difficulty with the technique, when they had higher levels of Pretest interest in math, and when they were females. Again there was a significant Goal Type X Achievement interaction, $F(1, 137) = 6.76$, $p<.05$ ($B = -.25$). Predicted values for the interaction are reported in Table 5. LAMs reported more enjoyment when assigned mastery goals, whereas HAMs reported more enjoyment when assigned performance goals. Participants in the multiple goal condition experienced similar, intermediate levels of enjoyment regardless of achievement level.

Regressing Inclination on the direct effects model revealed a significant main effect for Pretest interest, $F(1, 137) = 4.63$, $p<.05$ ($B = .18$), and a nearly significant Goal Type X Achievement Orientation interaction, $F(1, 137) = 3.72$, $p<.06$ ($B = .21$). Participants reporting higher levels of Pretest enjoyment wanted to learn more about additional mental math techniques than those reporting lower levels. Predicted values for the interaction are reported in Table 5. As in the previous interest analyses, LAMs wanted to learn more about additional techniques when assigned mastery goals, whereas HAMs indicated more interest in additional techniques when assigned performance goals. Participants in the multiple goal condition reported similar, intermediate levels of interest in additional techniques regardless of achievement orientation.

Direct Effects on Performance

Regressing Problems Attempted on the direct effects model revealed significant main effects for Pretest ability, $F(1, 137) = 36.40$, $p<.001$ ($B= .33$), Gender, $F(1, 137) = 16.17$, $p<.001$ ($B = -.21$), and Difficulty, $F(1, 137) = 209.35$, $p<.001$ ($B = -.73$). Participants who solved more problems in the Pretest ability assessment continued to solve more problems in the follow-up assessment. Males solved more problems than females. Participants solved more problems in the success condition than in the difficulty condition, verifying the manipulation check analysis presented earlier. However there were no significant direct effects involving goals.[10]

In Figure 4, the results for both interest and performance outcomes are summarized in a path diagram. To help represent the significant Goal Type X Achievement Orientation interaction, separate path diagrams were calculated for HAMs (one standard deviation above the mean) and for LAMs (one standard deviation below the mean) to show the effects that varied as a function of achievement orientation. In sum, results on all three interest measures suggest that the optimal goal differed depending on the achievement orientation of the participant, whereas goals were unrelated to performance outcomes.

Process Analyses

Mediational analyses were conducted to determine why different types of achievement goals might be optimal to assign for individuals who vary in achievement orientation. To demonstrate mediation, three criteria must be established (Judd & Kenny, 1981). First, a direct effect between a predictor and outcome variable must be found (as documented in the analyses for interest above). Second, to establish the initial mediational link, a direct effect between the predictor and mediator variable must be found. Third, while controlling for the predictor variable, a link between the mediator and outcome variable must be found. If mediation occurs, the direct effect between the original predictor and outcome will be partially or fully reduced.

Direct Effects on Process Measures. The first set of process measures, Competence Valuation and Anticipated Competence, were assessed before the difficulty manipulation occurred, thus no difficulty terms were tested. This resulted in an 11-term model.

Regressing Competence Valuation on this model revealed a significant main effect for Pretest ability, $F(1, 142) = 9.61$, $p<.01$ ($B = .25$). Participants who completed more problems in the initial assessment were more likely to value doing well in the activity. In addition, a significant Goal Type X Achievement Orientation interaction, $F(1, 142) = 4.12$, $p<.05$ ($B = .21$), was found. Predicted values for the interaction are reported in Table 6. LAMs were more likely to care about doing well when assigned a mastery goal than when assigned a performance goal. In contrast, HAMs were more likely to care about doing well when assigned a performance goal than when assigned a mastery goal. When assigned multiple goals, LAMs and HAMs experienced similar, intermediate levels of competence valuation.

Regressing Anticipated Competence on the model revealed significant main effects for Pretest interest, $F(1, 137) = 6.48$, $p<.01$ ($B = .25$), and Gender, $F(1, 137) = 12.25$, $p<.01$ ($B = -.28$), suggesting that participants who generally enjoyed math were more confident and that males were more confident than females. A significant Achievement Orientation X Gender interaction, $F(1, 137) = 5.62$, $p<.05$ ($B = -.19$), qualified the above gender main effect. For LAMs, males ($\hat{Y} = 5.06$) reported similar levels of confidence as females ($\hat{Y} = 4.89$). In contrast, for HAMs, males ($\hat{Y} = 5.41$) reported more confidence than females ($\hat{Y} = 4.50$).

The final process measure, Task Involvement, was assessed after difficulty was introduced, allowing the original direct effects model to be tested. Regressing the direct effects model on Task Involvement revealed a significant main effect for difficulty, $F(1, 137) = 15.60$, $p<.001$ ($B = -.30$). Participants in the difficulty condition were less involved in the task than participants in the success condition. In addition, a significant Goal Type X Achievement Orientation interaction, $F(1, 137) = 10.65$, $p<.01$ ($B = .33$), was found. Predicted values for the interaction are reported in Table 6. LAMs were more likely to get involved in the math activity when assigned a mastery goal than when assigned a performance goal. HAMs were more likely to get involved when assigned a performance goal than when assigned a mastery goal. When assigned multiple goals, LAMs and HAMs experienced similar, intermediate levels of involvement.

Mediational Effects. The Goal Type X Achievement Orientation interaction was significant on all three interest outcomes (meeting the first requirement for mediation), and was significantly linked to two of the process variables (meeting the second requirement for mediation). Thus, one final set of analyses was conducted to test the mediational model. Competence Valuation and Task involvement were added to the direct effects model to determine if the effects of the predictor variables documented earlier would be mediated through either or both process variables.

Regressing Freetime on the mediational model revealed only a significant main effect for Competence Valuation, $F(1, 135) = 15.65$, $p<.001$ ($B = .34$). Participants who valued doing well in the session spent more time looking at additional information about the new math technique during the free-choice period. Moreover, the previous Goal Type X Achievement Orientation interaction was no longer significant in the mediational model (meeting the third requirement for mediation). Therefore, Competence Valuation was a partial mediator of the direct Goal Type X Achievement Orientation interaction effect on freetime behavior.[11]

Regressing Enjoyment on the mediational model revealed significant main effects for both Competence Valuation, $F(1, 135) = 7.98$, $p<.01$ ($B = .21$), and Task Involvement, $F(1, 135) = 15.96$,

$p<.001$ ($B = .31$). Participants who valued doing well in the session reported more enjoyment, and participants who got absorbed in the task reported more enjoyment. The direct effect of difficulty remained significant, $F(1, 135) = 16.32$, $p<.001$ ($B = -.29$), and the direct effect of Pretest interest almost remained significant, $F(1, 135) = 3.51$, $p<.07$ ($B = .13$). However, the previous Goal Type X Achievement Orientation interaction was again no longer significant in the mediational model. Thus, Competence Valuation and Task Involvement were both more proximal mediators of the direct Goal Type X Achievement Orientation interaction effect on enjoyment.

Regressing Inclination on the mediational model, however, revealed no significant effects for either mediator. See Figure 5 for a revised path model incorporating both direct and mediational effects on interest and performance outcomes.

Finally, an additional analysis was conducted to investigate the possibility that goals could exert indirect effects on the performance measure through the process variables. Regressing Problems Attempted on the mediational model revealed a significant main effect for Task Involvement, $F(1, 135) = 7.58$, $p<.01$ ($B= .16$), indicating that participants who got more involved in the session were also more likely to solve more problems. The previous direct effects for Pretest ability, Gender, and Difficulty all remained significant. Thus, an indirect goal effect was established because the Goal Type X Achievement Orientation interaction was also linked to Task Involvement (See Figure 5).

Discussion

In contrast to Study 1 in which goals were self-set, mastery and performance goals had different effects when assigned to participants in Study 2. On interest outcomes, no one goal condition was optimal for all participants. Instead, the effects of assigned goals were moderated by personality characteristics, specifically individual differences in achievement motivation. Across all three measures of interest, assigning mastery goals promoted the highest levels of interest in the math activity when participants were low in achievement orientation. In contrast, when participants were high in achievement orientation, assigning performance goals promoted the highest levels of interest. Thus, it would appear that identifying the optimal goal to assign depends on having individual difference information about the intended recipient. This pattern of results replicates other laboratory investigations that have examined the effects of assigning either a single mastery or performance goals (e.g., Harackiewicz & Elliot, 1993). However, the current study offers a crucial extension to this prior work by including a multiple goal condition, by using an academic task, and by obtaining this pattern across both levels of difficulty. Although the multiple goal condition did not promote the highest levels of interest for participants either low or high in achievement motivation (see Table 5), it seems to have provided some buffer to LAMs who least preferred the session when assigned the performance-only goal and to add challenge for HAMs who least preferred the session when assigned a mastery-only goal.

Thus, assigning multiple goals to students may offer a compromise by promoting similar, intermediate levels of interest for all students. This "compromise" may be comparable to the one that we often face when deciding on the pace to cover material in a class. When material is covered too slowly, we are at risk of losing the interest of our more capable students who may become exceedingly bored with the learning environment. However, when material is covered too quickly, we are at risk of losing our less able students who may become increasingly anxious and detached. As a compromise we often structure the class to a pace optimal for the "average" student, knowing that at times we will be moving too slowly for some and at times too quickly for others.

An analysis of the process variables that mediate the goal-interest relationship helped to understand why assigning different types of achievement goals facilitated interest for different individuals. Specifically, competence valuation and task involvement were both found to mediate the direct Goal Type X Achievement Orientation effect. LAMs were more likely to value competence and to get absorbed in the math activity when assigned mastery goals. HAMs, on the other hand, were more likely to value competence and to get involved in the math activity when assigned performance goals. In turn, competence valuation and task involvement were found to be the mechanisms promoting interest in the math activity. Once again, this pattern replicates other laboratory investigations that have examined the mediational effects of assigning either a single mastery or performance goal (e.g., Harackiewicz & Elliot, 1993; 1998; Elliot & Harackiewicz, 1994). However, the current study offers a crucial extension of this prior work by revealing that HAMs and LAMs experienced similar, intermediate levels of competence valuation and task involvement when both goals were assigned.

As with the interest findings, no one goal condition promoted performance for all participants. However, unlike the interest findings, no interaction effects involving goals were found. Thus, assigning achievement goals for the learning session had no direct effect on performance in the math activity. The benefit of self-set performance goals observed in Study 1 could not be reproduced with the assignment of performance goals in this study. The fact that achievement goals did not affect performance was indeed disappointing. However, an investigation of process variables revealed one intriguing indirect effect. Assigning mastery goals promoted task involvement for LAMs, and assigning performance goals promoted task involvement for HAMs. To the extent that participants became more task involved, they also solved more problems with the new method. This finding suggests goals might influence performance through their effects on task involvement, and further suggests that the differential goal hypothesis may apply to performance as well as interest. In future research, other process variables more relevant to the goal-performance relationship may provide a richer understanding of what leads to differences in performance (e.g., effort, persistence, commitment; Locke & Latham, 1990).

The one finding that did emerge consistently across Study 1 and Study 2 was that difficulty did not interact with performance goals to reveal any particularly maladaptive effects when participants encountered difficulty while working under performance goals. Moreover, difficulty did not interact with mastery goals to reveal any particularly beneficial effects of pursuing mastery goals when participants encountered difficulty. This pattern remained consistent even with a stronger manipulation of difficulty in Study 2. Thus, we found no evidence that performance goals produced maladaptive learning when difficulty was encountered and perceived competence was lowered as a number of theorists have hypothesized (see also, Kaplan & Midgley, 1997; Miller et al., 1993). Instead, difficulty exerted an independent, negative effect on enjoyment and performance outcomes, suggesting the critical role that optimal challenge (i.e., the optimal level of difficulty) may have regardless of the type of achievement goal pursued (Csikzentmihalyi, 1975; 1990).

In sum, when goals were assigned, a more complex relationship between achievement goals and important educational outcomes was found. Without the inclusion of a critical moderator variable, this relationship would have gone undetected. Measuring achievement orientation was a key component in understanding this pattern and in predicting when assigned goals would have positive effects. Simply assigning particular goals was not enough to produce the same benefits as when those same goals were self-set. Additionally, because careful steps were taken to control for other variables that have made systematic comparisons between previous correlational and experimental studies of goals difficult (e.g., differences in age of population, type of task, and type of environment), we are in a better position to conclude that the differences observed across Study 1 and Study 2 involve the origin of the goal (i.e., whether it was self-set or assigned) rather than differences caused by contrasting methodologies (see Middleton & Midgley, 1997).

However, this added control does come with a cost. The current studies only used a college aged-population, and our findings may not apply to younger students. For example, Eccles and Midgley (1989) suggested that the transition from elementary to junior high school is marked by a shift to a more performance-oriented and competitive school climate. They argued that this change is mismatched with students' developmental stage resulting in a number of negative effects on students' motivation and performance (see also Anderman & Maehr, 1994). Thus, negative effects of performance goals may be especially prevalent in this age group. However, during this transition, there is also evidence that students begin to develop more normatively based conceptions of ability and are more likely to endorse performance goals. Although research based on younger age groups may reveal a particular advantage for the mastery goal perspective, students may better learn how to integrate both mastery and performance goal pursuits over time. Thus, in addition to synthesizing the findings of achievement goal literature based on different research methodologies, we also need to be cautious about synthesizing achievement goal findings across different age groups. Another shortcoming of many laboratory investigations is the length at which goal effects can be monitored. In the current studies, it took approximately an hour to train and evaluate each participant on just their initial performance and interest with the new math techniques, so our investigation was limited to this initial experience. It is possible that with additional trials or subsequent sessions (e.g., with repeatedly experiencing difficulty) a different pattern of goal effects would emerge. Thus, work in laboratory settings should continue to investigate longer-term effects of pursuing particular goals. Nevertheless, as already noted in the discussion of Study 1, the correlational results of self-set goals in our one-hour laboratory paradigm replicated the findings that we have found in semester long investigations of self-set goals in field studies of college classrooms (Harackiewicz, et al, 1997; in press).

General Conclusion

Currently a debate exists on which types of achievement goals promote optimal motivation. Early theorizing advocated a mastery goal perspective and the active shaping of environments to promote adoption of mastery goals (e.g., Ames, 1992; Dweck & Leggett, 1988).

In contrast, others support a multiple goal perspective in which both mastery and performance goals are pursued (Harackiewicz et al., 1998; Wentzel, 1991). Evaluating whether empirical evidence supports a mastery goal perspective seems straightforward. One would look for positive associations between mastery goals and academic outcomes, and negative or null associations between performance goals and achievement outcomes. However, as a field, we need to recognize that evidence supporting a multiple goal perspective is more complex and may appear in a number of different forms, especially depending on whether the goals are self-set by the individual or assigned by others. Thus, in this paper, we advanced four hypotheses suggesting how multiple goals might promote optimal motivation. We found support for two of these more complicated versions of the multiple goal perspective (specifically, the specialized goal hypothesis in Study 1 and the selective goal hypothesis in Study 2). Failure to consider or test for alternative evidence supporting a multiple goal perspective may mask what type of achievement goal (or goals) are best to pursue.

A second issue being debated in the literature is whether an achievement goal orientation is situationally determined or more of an individual difference variable (Pintrich & Schunk, 1996). From an intervention standpoint, an optimistic view would suggest that achievement goals can be influenced by situational factors and that we can actively shape students' goals by manipulating characteristics of our classrooms to encourage pursuit of particular goals. A more pessimistic view would suggest that achievement goal orientation is a relatively fixed individual difference variable and that we must tailor and structure education to the needs of each student – a more daunting task. Pintrich and Schunk (1996) recommended an interactional perspective (Mischel, 1990) and proposed that in weak situations individual differences may be more important in shaping the goals that students pursue, but that in strong situations predispositions to particular goals may be over-ridden. The fact that assigned goals in the present study were unable to produce effects similar to those of self-set goals may be a function of the strength of the assigned goal intervention. The intervention involved a manipulation that lasted no more than 30 seconds, arguably quite different from the type of manipulation that might be established in a classroom or work setting.

In the meantime, in light of the limitations of the existing literature and the results of the current studies, calls to adopt policies to direct students' attention away from performance goals and conclusions supporting a strict mastery goal perspective are premature. We need to continue to conduct research (and/or re-analyze data from previous research studies) that provide more comprehensive tests of multiple goal benefits before concluding that a mastery goal perspective is best. Instead, we may be better off encouraging individuals to adopt mastery goals along with, rather than in place of, performance goals if they are to be optimally motivated in their achievement pursuits.

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Footnotes

1. A variety of labels have been used to differentiate between these two general classes of goals. For example, mastery goals also have been called task goals (Nicholls, 1984), learning goals (Dweck & Leggett, 1988), and intrinsic goals (Pintrich & Garcia, 1991). Performance goals also have been called ego goals (Nicholls, 1984), ability goals (Ames & Ames, 1984), relative ability goals (Midgley, et al., 1998), and extrinsic goals (Pintrich & Garcia, 1991). Following the convention of others (Ames, 1992; Pintrich & Schunk, 1996), mastery and performance goals will be used as labels throughout this paper.

2. A number of theorists have also re-examined the performance goal construct and argued that it confounds theoretically distinct components (Elliot and Church, 1997, Middleton and Midgely, 1997, Skaalvik, 1997, Wolters, Yu, & Pintrich, 1996). For example, Elliot and Harackiewicz (1996) and Elliot & Church (1997) separated the performance goal construct into performance-approach goals, where an individual's goal is to demonstrate being competent, and performance-avoidance goals, where an individual's goal is to just avoid being incompetent. When separated, maladaptive learning patterns were associated with performance-avoidance goals and adaptive learning behaviors with performance-approach goals. Thus, our discussion of multiple goals will focus on the potential benefits of pursuing performance-approach goals <u>in addition</u> to mastery goals.

3. Adopting multiple goals could also prove detrimental to motivation. According to a distraction hypothesis, pursuing more than one type of goal might disrupt motivation, especially when those goals are in direct conflict with each other (Sheldon & Kasser, 1995). Statistical support for this hypothesis would come in the form of a negative Mastery X Performance goal interaction, suggesting that students are better off pursuing a single mastery goal than both goals together.

4. Multiple regression provides a powerful and flexible data analytic strategy to test the simultaneous and interactive effects of mastery and performance goals. Both the main effect terms and the mastery X performance cross product term can be tested simultaneously in regression models, and it also provides the opportunity to test how goals interact with other variables. Furthermore, multiple regression offers a number of key statistical advantages over ANOVA procedures that have been more commonly used in the literature. For example, regression avoids arbitrary median splits required to create different groups from continuous measures, the loss of

power that can result with using dichotomized measures (especially for providing a legitimate test of the interaction term), and the potential for finding false significance that can occur through artificial dichotomization (Maxwell & Delaney, 1993).

5. In a comprehensive, meta-analytic review of gender differences in mathematics performance, Hyde, Fennema, and Lamon (1990) reported only a small overall difference ($d = .20$) indicating that males outperformed females. When further differentiating studies by the content and cognitive level of the mathematical test, however, gender differences were less apparent and even reversed. No gender differences were noted when the content of the test involved only arithmetic ($d = .00$), and a small effect favoring females was found when the cognitive level of the test involved only computation (i.e., when the test only required algorithmic procedures to find a single numerical answer; $d = -.14$). When differentiating studies by age and selectivity of the sample, males tended to outperform females during the ages of 19-25 ($d = .45$) and in more selective populations (such as college populations; $d = .33$). Thus definitive predictions in the current study were difficult to offer. In a separate meta-analytic review of gender differences in attitudes and affect regarding math (e.g., math interest, math anxiety, and math confidence), Hyde, Fennema, Ryan, Frost, and Hopp (1990) found that females held more negative views, but the magnitude for gender differences was small and similar to the overall effect size for gender differences in math performance (generally $d < .15$).

6. Manipulation check questions revealed that each participant attempted to use the new math strategies during the follow up assessment. However, 12 participants indicated that they used a combination of their old and new techniques. In addition, no one indicated having used this particular technique before.

7. Regressing the actual number of problems solved correctly on the final model revealed an identical pattern of findings with one exception. On performance, there was a significant Mastery Goal x Gender interaction. Males solved more problems correctly when their level of mastery goal adoption was low ($\hat{Y} = 20.70$) than when their level of mastery goal adoption was high ($\hat{Y} = 16.58$). In contrast, females solved more problems correctly when their level of mastery goal adoption was high ($\hat{Y} = 15.44$) than when it was low ($\hat{Y} = 14.22$).

8. In an earlier pilot test, the order in which the multiple goals were presented was varied, and participants' initial reactions were investigated using similar measures to the ones in the

present study. There were no order effects in how participants reacted to the multiple goal condition.

9. Participants were instructed to restate the purpose of the session and the goal that they were recommended to follow in their own words. Coding of these open-ended responses revealed that all participants correctly answered these questions and understood the assigned goal for the session.

10. Regressing the actual number of problems solved correctly on the final model revealed an identical pattern of findings with one exception, a significant main effect was also found for Pretest interest. Participants who reported higher pre-interest in math solved more problems correctly.

11. In addition, a new Goal Type X Gender interaction emerged, $F(1, 135) = 3.92$, $p<.001$ ($B = -.19$), suggesting that males spent the most to least time looking at additional information when assigned a performance goal, multiple goals, and mastery goal, respectively. Females, on the other hand, spent the most to least time looking at additional information when assigned a mastery goal, multiple goals, and performance goal, respectively.

Table 1. Descriptive Statistics for Study 1.

Variable	Range	M	SD
Pretest Ability	0 – 63	24.99	8.02
Pretest Interest	1 – 7	4.39	1.84
Mastery Goals	1 – 7	4.97	1.23
Performance Goals	1 – 7	4.20	1.40
Enjoyment	1 – 7	5.51	.93
Behavioral Inclination	0 – 1	.77	.42
Freetime	0 – 300	84.71	110.93
Performance (N = 166)	0 – 63	20.02	9.25
Success (N = 85)	0 – 63	26.04	8.18
Difficulty (N = 81)	0 – 63	13.72	5.25

Table 2. Zero-Order Correlations for Study 1.

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender[1]	-									
2. Pretest Ability	-.02	-								
3. Pretest Interest	-.11	.09	-							
4. Mastery Goals	.09	.14	.29**	-						
5. Performance Goals	-.12	.15	.31**	.31**	-					
6. Enjoyment	.01	-.08	.26**	.39**	.11	-				
7. Behavioral Inclination	-.23**	-.02	.20*	.31**	.10	.46**	-			
8. Freetime	-.21**	.04	.14	.23**	.14	.28**	.18*	-		
9. Performance	-.27**	.33**	.15	-.04	.23**	.19*	.12	-.04	-	

*p<.05.

**p<.01.

[1]Gender is coded +1 for females and –1 for males.

Table 3. Descriptive Statistics for Study 2.

Variable	Range	M	SD
Achievement Orientation	0 – 16	9.58	3.24
Pretest Ability	0 – 63	25.52	7.30
Pretest Interest	1 – 7	3.79	1.76
Competence Valuation	1 – 7	4.30	1.14
Task Involvement	1 – 7	4.95	1.02
Anticipated Competence	1 – 7	4.92	.97
Enjoyment	1 – 7	5.20	.91
Behavioral Inclination	0 – 1	.73	.44
Freetime	0 – 300	77.56	110.19
Goal Commitment	1 – 7	4.11	1.33
Performance (N = 154)	0 – 63	18.70	8.29
Success (N =81)	0 – 63	24.36	6.80
Difficulty (N =73)	0 – 63	12.42	4.33

Table 4. Zero-Order Correlations for Study 2.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Achievement Orientation	-											
2. Gender[1]	.18*	-										
3. Pretest Ability	.19*	.26**	-									
4. Pretest Interest	.05	-.02	.13	-								
5. Competence Valuation	.18*	.15	.29**	.13	-							
6. Task Involvement	.11	.03	-.03	-.04	.20*	-						
7. Anticipated Competence	.00	-.28**	-.04	.25	-.05	.03	-					
8. Enjoyment	.12	.14	.07	.11	.34**	.45**	.03	-				
9. Behavioral Inclination	.06	.08	.00	.16*	.10	.11	-.02	.41**	-			
10. Freetime	.04	-.03	.19*	.16*	.37**	.08	.09	.29**	.09	-		
11. Goal Commitment	.01	.02	.11	-.03	.26**	.13	.15	.22**	.11	.13	-	
12. Performance	.04	-.14	.25**	.06	.02	.31**	.15	.27**	.04	.07	.21**	-

*p<.05. **p<.01.

[1]Gender is coded +1 for females and –1 for males.

Table 5. Predicted Values for Freetime, Enjoyment, and Inclination as a Function of Goal type and Achievement Orientation for Study 2.

	Goal Type		
Achievement Orientation	Mastery	Both	Performance
Low			
Freetime			
Enjoyment	122.23	87.05	51.86
Inclination	5.45	5.17	4.85
	.79	.76	.71
High			
Freetime	58.46	76.05	93.64
Enjoyment	5.13	5.26	5.40
Inclination	.61	.75	.89

Note. Values are predicted from regression equations for individuals one standard deviation below (low) and one standard deviation above (high) the mean for achievement orientation. Scores on Freetime could range from 0 to 300 (seconds), scores on Enjoyment could range from 5 to 35, and scores on Inclination could range from 0 to 1, which represents the percentage of participants who indicated being interested in learning about similar techniques in the future.

Table 6. Predicted Values for Competence Valuation and Task Involvement as a Function of Goal Type and Achievement Orientation for Study 2.

	Goal Type		
Achievement Orientation	Mastery	Both	Performance
Low			
Competence Valuation			
Task Involvement	4.56	4.22	3.89
	5.37	4.85	4.36
High			
Competence Valuation	4.26	4.41	4.56
Task Involvement	4.83	4.99	5.15

Note. Values are predicted from regression equations for individuals one standard deviation below (low) and one standard deviation above (high) the mean for achievement orientation.

Figure Captions

Figure 1. Hypothetical data supporting alternative versions of the multiple goal perspective.

Figure 2. Path model of the predictors of interest and performance outcomes in Study 1. All paths represented are significant ($p<.05$). Path coefficients are standardized regression coefficients. A path with two coefficients represents an effect that varies as a function of a significant interaction. Difficulty is coded as (-1) for less difficult problem condition and (+1) for the more difficult problem condition. Significant effects for gender and covariates have been omitted to simplify the diagram.

Figure 3. Figure based on Harackiewicz and Sansone's (1991) process model of intrinsic motivation.

Figure 4. Path model of the direct effects on interest and performance outcomes in Study 2. This model was constructed from a single set of regression analyses, but is presented in two panels to show the effects that varied as a function of achievement orientation. The top panel shows the model for individuals high in achievement orientation, and the bottom panel shows the model for individuals low in achievement orientation. Path coefficients are standardized regression coefficients. Solid paths indicate significant effects ($p<.05$, with the exception that the path to Inclination was nearly significant, $p<.06$). Dashed paths indicate paths that differ significantly as a function of purpose goal conditions; in these cases, path coefficients were separately estimated for the effect of Goal Type for HAMs (top panel) and LAMs (bottom panel). The Goal Type effect is coded (-1) for mastery goal, (0) for both goals, and (+1) for performance goal. Difficulty is coded as (-1) for success condition and (+1) for difficult condition. Significant effects for gender and covariates have been omitted to simplify the diagram.

Figure 5. Path model of direct and mediated effects on interest and performance outcomes in Study 2. This model was constructed from a single set of regression analyses, but is presented in two panels to show the effects that varied as a function of achievement orientation. The top panel shows the model for individuals high in achievement orientation (HAMs), and the bottom panel shows the model for individuals low in achievement orientation (LAMs). Path coefficients are standardized regression coefficients. Solid paths indicate significant effects ($p<.05$, with the exception that the path to Inclination was nearly significant, $p<.06$). Dashed paths indicate paths that differ significantly as a function of purpose goal conditions; in these cases, path coefficients

were separately estimated for the effect of Goal Type for HAMs (top panel) and LAMs (bottom panel). The Goal Type effect is coded (-1) for mastery goal, (0) for both goals, and (+1) for performance goal. Difficulty is coded as (-1) for success condition and (+1) for difficult condition. Significant effects for gender and covariates have been omitted to simplify the diagram.

Figure 1a. Example Data Supporting an Additive Goal Hypothesis

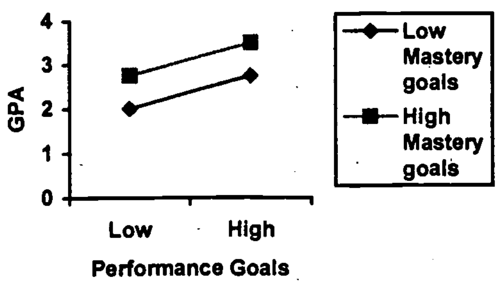


Figure 1b. Example Data Supporting an Interactive Goal Hypothesis

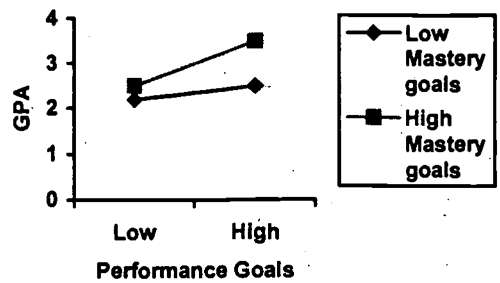
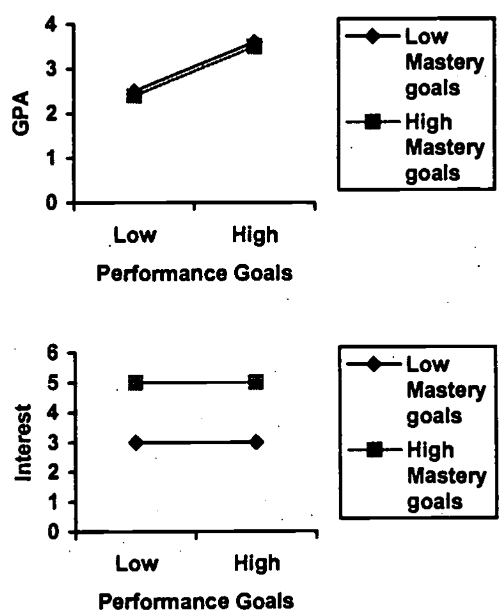
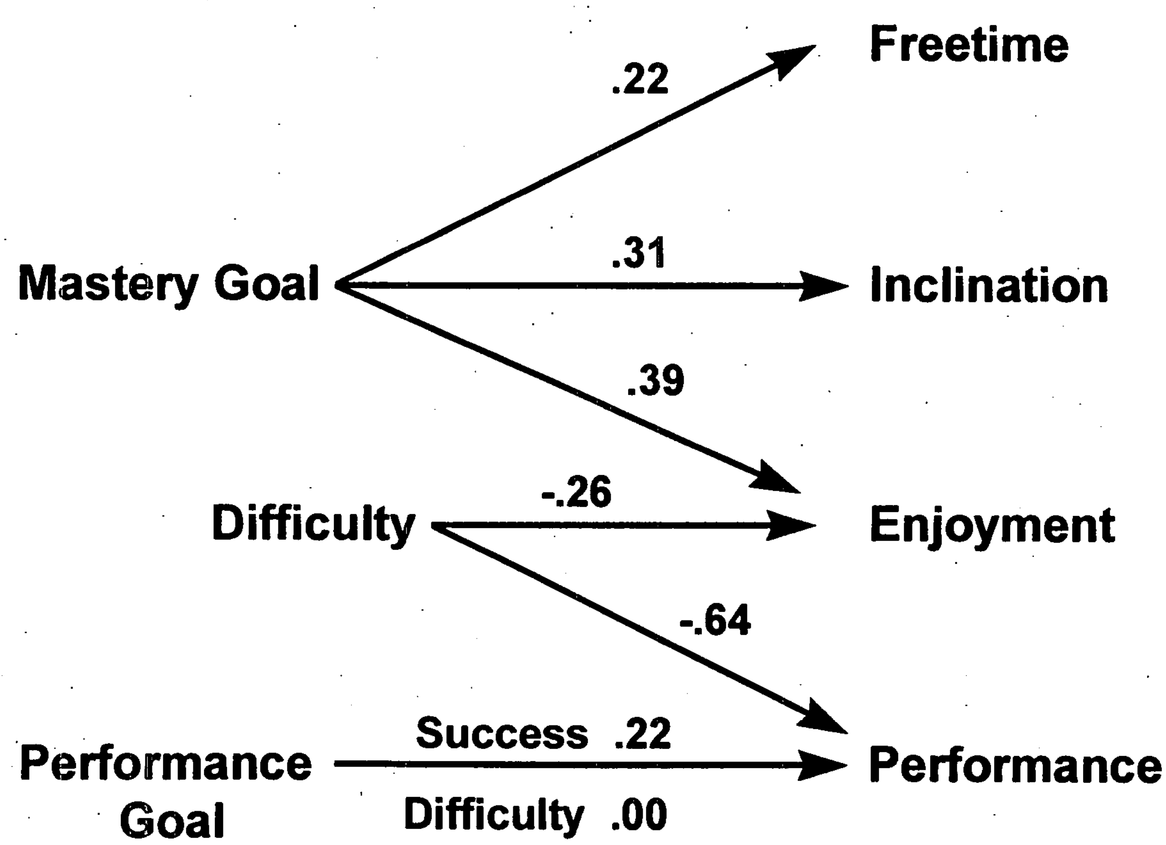
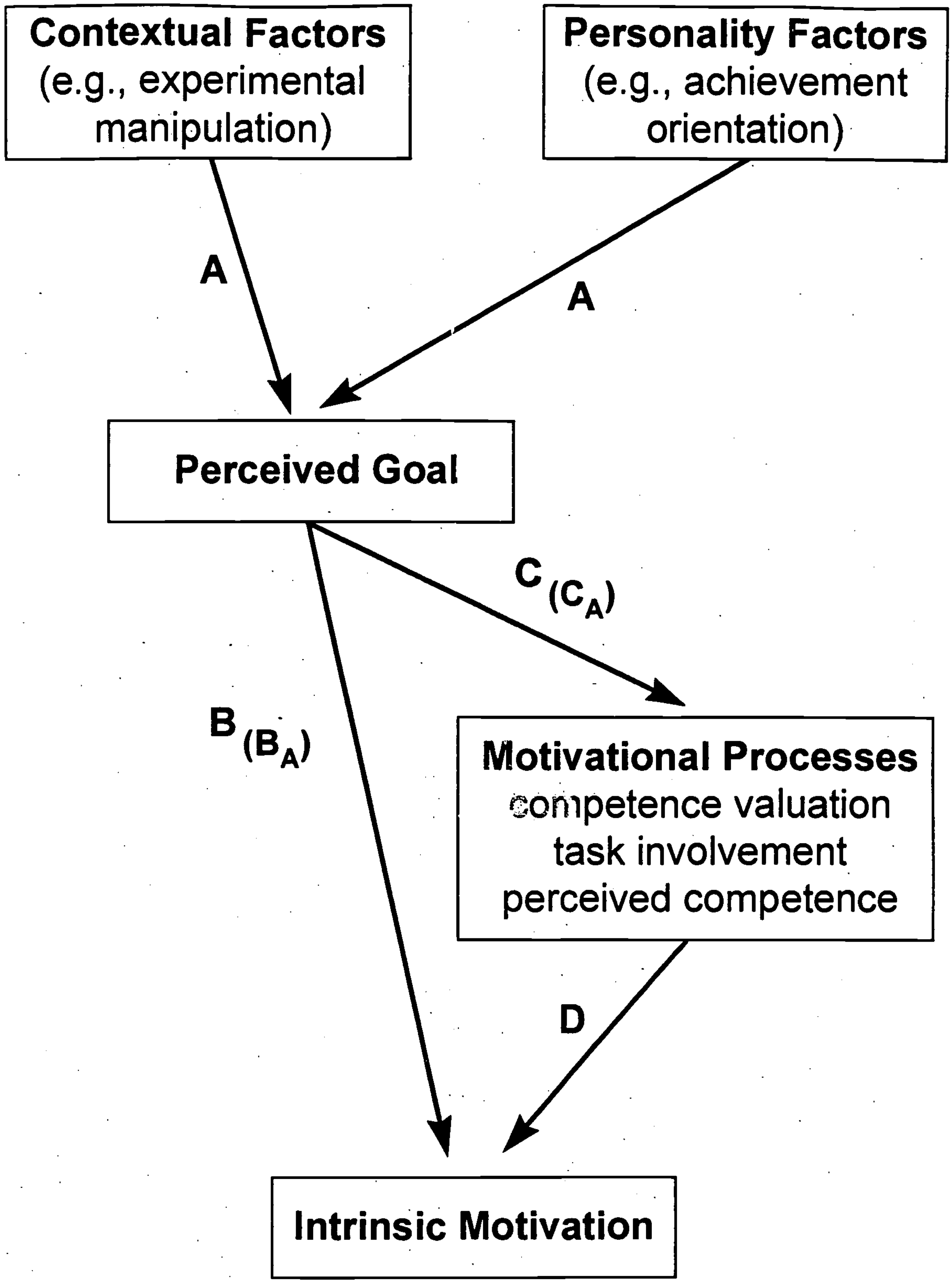
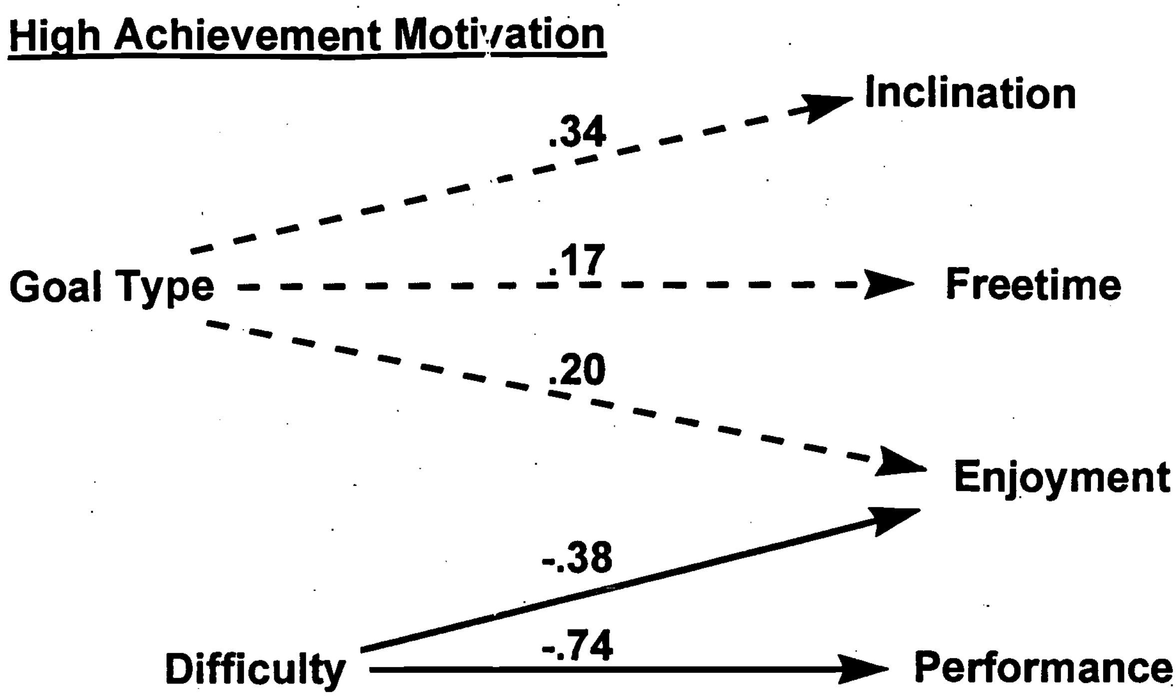


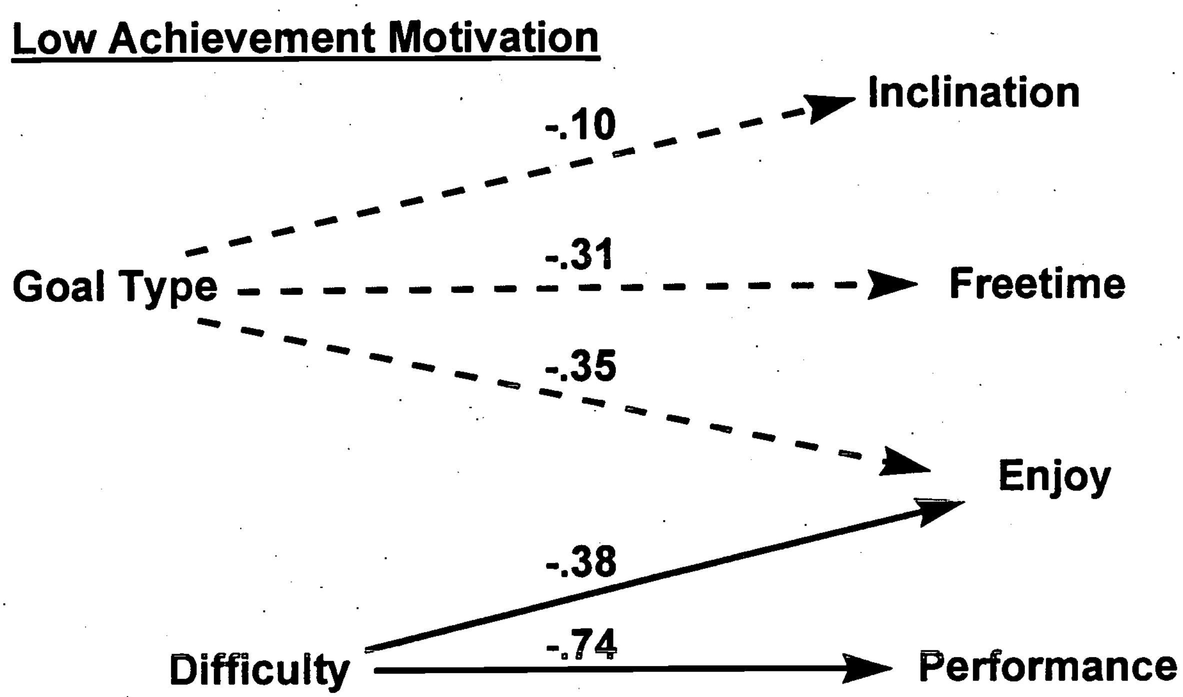
Figure 1c. Example Data Supporting a Specialized Goal Hypothesis



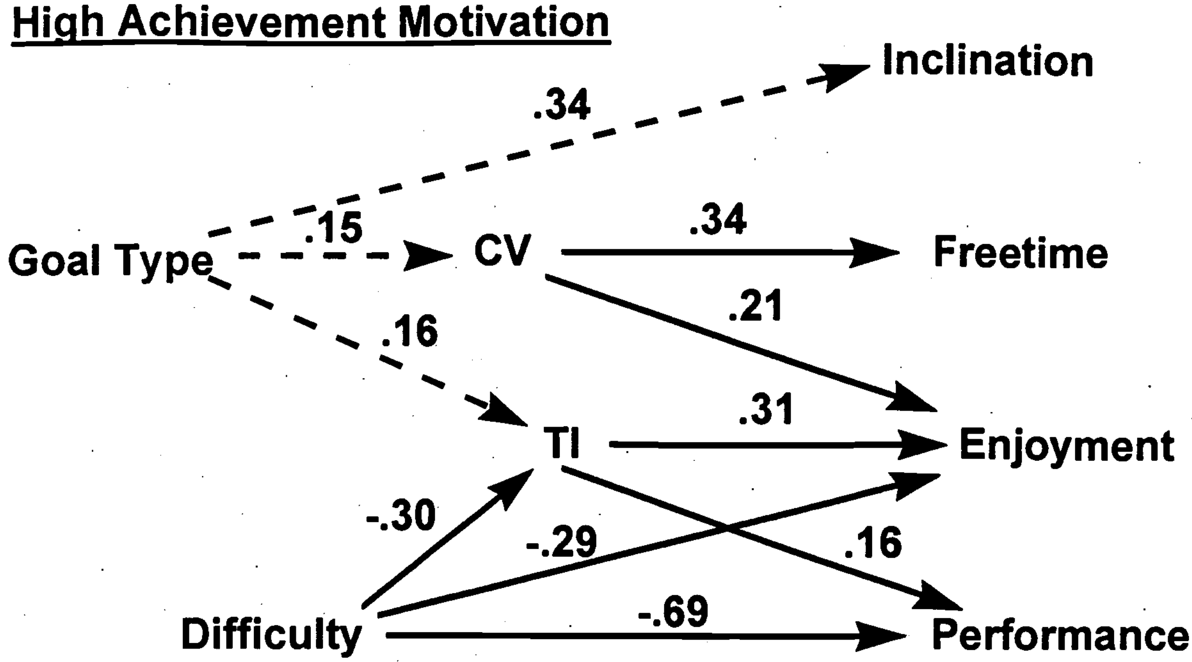

Mastery Goal
.22
Freetime
.31
Inclination
.39
Difficulty
-.26
Enjoyment
-.64
Performance Goal
Success .22
Difficulty .00
Performance


Contextual Factors
(e.g., experimental manipulation)
Personality Factors
(e.g., achievement orientation)
A
A
Perceived Goal
C
(C_A)
B
(B_A)
Motivational Processes
competence valuation
task involvement
perceived competence
D
Intrinsic Motivation

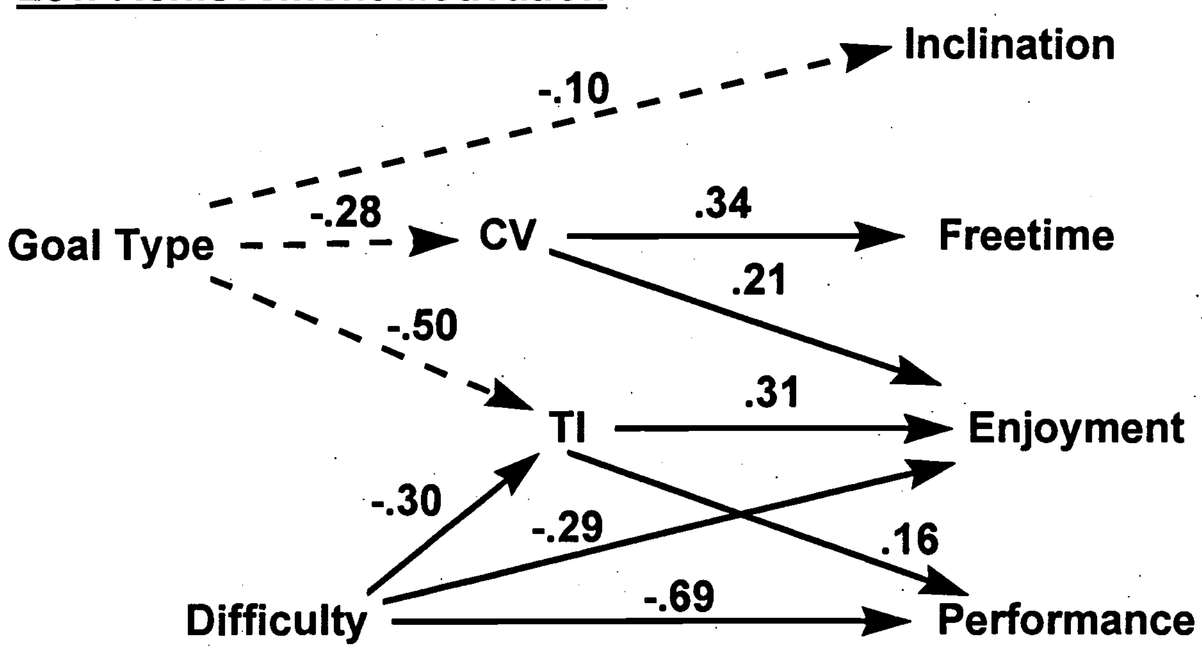

High Achievement Motivation
Goal Type
Difficulty
.34
.17
.20
-.38
-.74
Inclination
Freetime
Enjoyment
Performance


Low Achievement Motivation
Goal Type
Difficulty
-.10
-.31
-.35
-.38
-.74
Inclination
Freetime
Enjoy
Performance

High Achievement Motivation



Low Achievement Motivation



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