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SELF-REGULATION IN CONCURRENT MULTIPLE-GOAL CONTEXTS: THE ROLE OF DISCREPANCIES, SUPERORDINATE GOAL FRAMING, AND INDIVIDUAL DIFFERENCES ON DYNAMIC GOAL PRIORITIZATION

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AARON M. SCHMIDT

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Aaron M. Schmidt

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INTRODUCTION

Life is characterized by the pursuit of multiple, conflicting goals over time. In some cases, goals are diametrically opposed, such that progress towards one goal necessarily results in movement away from another. Even when goals are not diametrically opposed, time limitations often dictate that time devoted to the attainment of one goal results in reduced time available for the attainment of another. Such conflicts are becoming increasingly prevalent within the workplace. Many occupations require individuals to perform a multitude of tasks continuously throughout the workday, necessitating decisions about where to allocate ones time and attention at any given point in time. Indeed, multi-tasking – characterized by working towards multiple goals within the same limited time period, switching frequently from one task to another – has become an increasingly common aspect of job performance (Lassk, Kennedy, Powell, & Lagace, 1992).

Despite the ubiquitous nature of goal conflict within the workplace and beyond, little theoretical or empirical work has been directed towards understanding how individuals prioritize among multiple goals over time. Much of the existing research addresses an important but limited aspect of behavior, in which individuals pursue a single goal or make a single one-shot decision concerning which of a set of alternatives will be chosen. While informative, this research provides only limited insights into behavior in multiple-goal contexts. In such contexts, the problem posed to individuals is more complex than determining how to pursue a single goal or which of a set of goals to pursue. Rather, it is important to understand *how* individuals go about pursuing multiple

competing goals dynamically over time, shifting from one goal to another as the situation unfolds.

Though a sizeable body of literature exists within cognitive psychology concerning multi-task performance, the focus of that research does not address the issue of concern in this paper. The typical purpose of cognitive research on multi-task performance is to understand the fundamental characteristics of human attention. Much of this research is based on the assumption that the selectivity of attention – the marked tendency to attend to only a very limited number of stimuli at any one point in time – is due to the limited information-processing capacity of the brain. It is assumed that individuals have a limited pool of attentional resources that can be allocated to various activities, with resources devoted to one task detracting from the resources available for others. Within this paradigm, dual-task experiments are conducted to assess the extent to which particular cognitive processes of interest utilize attentional resources. In a typical dual-task study, participants are instructed to focus primarily upon the performance of a given task, while performing a secondary task with any "residual" attention that is not consumed by the primary task. In this way, performance on the secondary task provides an index of the extent to which the primary task is consuming attentional resources.

Allport (1989) questions the assumption that limited capacity is responsible for the selectivity of attention. Rather, he proposes that the selectivity of attention arises from the need for coherent action control. To execute goal-directed action, individuals must focus on stimuli relevant to the attainment of that goal. For example, suppose one is reaching for a coffee mug on a table. Many other objects can be seen and could be and could be attended to as well. However, reaching the mug requires that it be attended to in

a unique fashion, such that only the mug determines where one reaches. That is, the mug must be selected so that it can determine the appropriate movements and positioning of one's arm and hand. Allport refers to this process as selection-for-action. Regardless of the perspective one favors concerning the selectivity of attention, the research on attention is clear in demonstrating that individuals are frequently unable to simultaneously attend to multiple tasks, particularly when those tasks require the use of an overlapping set of cognitive and/or physical systems.

While the cognitive research utilizing dual-task paradigms has provided many important insights into human attention, there is a surprising lack of research that examines multi-task performance from a motivational perspective. That is, the focus of the cognitive literature is on what people *can* do, but does not address what individuals *will* do under realistic conditions. In the cognitive research described above, participants have relatively little responsibility for determining the priority of performance on the two tasks or when and how to go about shifting attention from task to task. These factors are an integral part of the experimental design and, thus, have been predetermined by the experimenter. However, in many typical multi-tasking situations in organizational settings, individuals are responsible for determining which of their many tasks and responsibilities will be pursued at any given point in time.

Despite the prevalence of multiple, conflicting goals in the work environment, little theory or research has considered this issue. An emphasis on single-goal pursuit has dominated the literature (see Austin & Vancouver, 1996 and Locke & Latham, 1991 for reviews of this literature). Further, much of this research is limited to single behavioral instances, while real-world behavior is characterized by processes that unfold over time.

Although theory and research emerging from this single-goal/single-trial perspective has done much to forward our knowledge of work motivation, the limitations of this perspective should not be ignored. Consideration of motivation within environments characterized by multiple goals across time can lend greater understanding of behavior in environments more characteristic of those to which our theories are attempting to speak.

This dissertation is an attempt to move towards just such a perspective. I begin by briefly describing some of the limitations of a single-goal perspective and, in so doing, highlight the need to consider motivational phenomena from a multiple goal perspective. Next, existing theoretical perspectives that bear relevance to the issue of goal prioritization will be reviewed. Classical models of decision making, which are typically based upon the expected utility perspective (e.g., von Neumann & Morgenstern, 1947), will be discussed, including the limitations of this research with respect to the questions addressed herein. Dynamic models of motivation will then be discussed, focusing in particular on control theory models of self-regulation and the role of superordinate goals on prioritization. A conceptual model is proposed, incorporating numerous theoretical perspectives, including research concerning the influence of approach and avoidance constructs. Finally, an empirical study designed to test the propositions of the theoretical model is described.

Limitations of the single-goal perspective

Motivation researchers have frequently bemoaned the need for theory and research that considers how individuals cope with the myriad of goals they face throughout the course of each day (e.g., Austin & Vancouver, 1996; Carver, 1994; Locke & Latham, 1990). These calls reflect an awareness that single-goal research provides

only limited insight into self-regulation in real-world situations, which are frequently characterized by multiple demands on one's time. The generalizability of single-goal research to multiple-goal situations is unclear; phenomena observed under single-goal environments may not operate in the same manner within multiple-goal environments. For example, Locke (1982) observed that individuals given specific, difficult goals concerning the number of uses for common objects to create in one-minute continued to attempt to achieve their goals, even when the goals were set well beyond the ceiling of their ability. While this finding is intriguing in its own right, one must wonder if the same findings would result given multiple goals to work towards. Given multiple goals, individuals may shift their focus to the attainment of alternative goals when further progress toward the initial goal is blocked.

As another example, consider social cognitive theory's (Bandura, 1997) proposition that, upon attaining one's goals, those with high self-efficacy set more difficult goals to pursue (i.e. discrepancy *production*). Proponents of social cognitive theory argue that discrepancy *production* is a hallmark of human motivation. Moreover, they criticize alternative theories that emphasize discrepancy *reduction* (i.e. behavior directed at reducing the difference between one's goals and their current status) as overly mechanistic and non-representative of human self-regulation (e.g., Bandura & Locke, 2003). While it is clear that individuals often do set increasingly difficult goals upon the attainment of prior goals (e.g., Phillips, Hollenbeck, & Ilgen, 1996), this phenomenon is difficult to fully understood without considering other goals that compete for individuals' time and attention. Indeed, upon meeting one goal, individuals may choose to shift

attention to other goals that have yet to be attained rather than increasing the difficulty of the goal that has been achieved.

A related limitation of single-goal research concerns the strength of the situation within which behavior occurs. Goal setting studies typically present participants with relatively strong situations. The power of strong experimental settings to induce conformity among participants is well documented (e.g. Milgram, 1963). Participants often attempt to satisfy the perceived requirements of the situation. Studies presenting single goals may represent relatively strong situations, as the combination of participants conformity to experimental demands, along with the effort-directing influence of goal setting – touted as a primary mechanism underlying the utility of goal-setting interventions (Locke & Latham, 1990) – may result in greater acceptance and striving toward the goals than would be observed in weaker situations. Multiple goal environments, in contrast, provide multiple acceptable courses of action, along with less information concerning what behaviors are expected or desired. Thus, the multiple-goal context may yield results that are quite distinct from those obtained in single-goal studies. Moreover, personality characteristics may play a larger role in determining behavior in multiple goal environments than is typically observed in single-goal studies. Many work environments provide multiple goals to be achieved and less clear demands than is seen in many goal setting studies. Thus, examining dispositional characteristics in multiple goal environments may provide a better understanding of how these constructs operate in the workplace.

As these examples illustrate, the single-goal paradigm can lead to incomplete and even potentially misleading conclusions concerning important self-regulatory processes.

Thus, understanding how individuals pursue multiple goals is of both theoretical and practical significance. Unfortunately, given the dominance of the single-goal paradigm, relatively little is known about how individuals pursue multiple competing goals, what factors influence goal prioritization, and what factors lead individuals to revise the prioritization of multiple goals dynamically over time.

To develop a better understanding of this phenomenon, existing theoretical perspectives relevant to goal prioritization will be reviewed, focusing first upon classical theories of motivation and decision making. The limitations of existing research on classical decision theories will be discussed. Next, dynamic models of motivation will be discussed, focusing in particular upon the control theory model of motivation and self-regulation (e.g., Carver & Scheier, 1998; Lord & Levy, 1994; Powers, 1973). These theories have the potential to provide greater understanding of the dynamic processes involved in multiple goal regulation. However, the current state of the literature provides an incomplete and inconsistent picture concerning how individuals pursue multiple competing goals. This inconsistency creates the need for further theoretical and empirical development on this issue.

Theoretical Perspectives

Classical Decision Theories

The simultaneous pursuit of multiple, competing goals presents individuals with a dilemma. Individuals must decide where to focus their attention at any given point in time, as the actions required for pursuing one goal are often incompatible with those required for others (e.g., Allport, 1989; Lord & Levy, 1994). Models of decision making may help elucidate the nature of the problem and provide insight into factors that

influence the goal prioritization. In this section, classical models of decision making will be discussed, focusing on theories based upon the expected utility perspective, including expectancy-value theories and Kahneman and Tversky's (1979) prospect theory. However, for reasons that will be detailed below, the contribution of existing research on cognitive choice theories to the ultimate resolution of this issue is far from complete.

Expectancy-value theories. Many decisions involve a certain degree of risk, as the occurrence of various positive and negative outcomes resulting from a particular course of action are rarely guaranteed. One of the most dominant approaches to choice and preference under risk has been the expected utility approach (Hastie, 2001; Stevenson, Busemeyer, & Naylor, 1991). In its simplest form, the expected value or utility of an option is calculated as the sum of the value associated with each outcome multiplied by that outcome's probability of occurrence (i.e., $EV = \Sigma v_i p_i$). The decision maker then chooses the option with the greatest expected value. For example, suppose an automobile manufacturer is deciding between replacing an existing model with a new model and retaining the existing model. If the new model is introduced, there is a 75% chance it will make $300 million in profits and there is a 25% chance the new model will fail, resulting in a loss of $100 million. If the existing model is retained, there is a 60% chance that it will make $200 in profits and a 40% chance it will result in a loss of $5 million. The expected utility of replacing the existing model is (.75 * $300M) + (.25 * – 100M) = 200M, whereas the expected utility of retaining the current model is (.60 * $200M) + (.40 * – 5M) = 118M. Replacing the existing model has a higher expected utility, thus it would be predicted that the decision maker would choose that option.

Expectancy-valance models have been adapted as models of motivation, with Vroom's (1964) VIE theory being the most familiar and influential among organizational researchers. The three major constructs in VIE theory are valance, instrumentality, and expectancy. Expectancy is the belief or perceived probability that an action or behavior will lead to a particular outcome, such as a given level of performance. Instrumentality refers to the perceived relationship between two outcomes or, stated differently, the perceived probability that a particular outcome (ex. a given level of performance) will lead to a secondary outcome (ex. pay or promotion). Finally, valance refers to the subjective value that an individual places on a given secondary outcome. An outcome which one views as highly desirable possesses higher valance. Vroom argued that these three components combine multiplicatively to determine the "motivational force" for a particular behavior. Expectancy-valance theories are hedonistic in nature, proposing that individuals will make choices that maximize motivational force – those that maximize the product of expectancy, valance, and instrumentality. Thus, with respect to the prioritization of multiple competing goals, expectancy-value theories suggest that individuals will choose to focus on whichever goal has greater motivational force.

Expectancy-valance theories enjoyed a long reign as one of the most dominant theoretical perspectives on human motivation. Indeed, their dominance was once so complete that Kuhl remarked "stating that modern theories of social motivation are expectancy-value theories amounts to a tautology" (1984, p. 125). While initial support for the model was modest and inconsistent, much of the inconsistency has been attributed to methodological and measurement issues (Campbell & Pritchard, 1976; Mitchell, 1974). For instance, the common practice of testing the theory with between-person

designs is counter to the within-person nature of the theory. Vroom (1964) proposed the theory as an approach to understanding how a given individual makes choices among alternatives. Tested in this manner, the results have been more compelling (Mitchell, 1982). For example, Connolly and Vines (1977) found that VIE theory accurately predicted 68% of the actual choices of high school students selecting undergraduate institutions. Dillard (1979) found that VIE theory predicted 45% of the variance in accounting employees' preferences for three different positions within and outside their firm. VIE theory has also been relatively successful in predicting job satisfaction (e.g., Kopelman, 1977; Pritchard, DeLeo, & Von Bergen, 1976; Reinharth & Wahba, 1976). A large number of studies have also examined the ability of VIE theory to predict job effort. In this regard, it has been less successful. For example, Reinharth & Wahba (1976) attempted to predict effort and performance among employees of three different organizations. The three VIE components combined were only able to explain 5% of the variance in two of the organizations, and none of the variance in the third. A number of other studies also found similar results, with motivational force accounting for roughly 5 – 10% of the variance in job effort (e.g., Kopelman, 1977; Kopelman & Thompson, 1976).

Some research has also examined the relationship between the VIE components and goal-related constructs. For example, Matsui, Okada, and Mizuguchi (1981) found that motivational force was related to the difficulty level of the performance goal individuals adopted on a number-comparison task. Klein (1991) likewise found that the VIE theory constructs were positively related to choice of goal difficulty level. Hollenbeck and Klein (1987) asserted that one's commitment to a goal is affected by the

attractiveness or valance of attaining that goal, along with the expectancy of goal attainment. Thus, to the extent that one believes the goal can be attained and that reaching the goal will lead to valued outcomes, goal commitment will be high.

Thus, it appears that expectancy-valance theory may be of use in determining how individuals pursue multiple goals that are competing for their resources. Drawing from expectancy-valance theories, it would be expected that individuals focus on whichever goal has the highest multiplicative combination of expectancy, valance, and instrumentality. Thus, all else being equal, expectancy of success, valance, and instrumentality would all be positively related to goal priority. However, as elaborated below, a number of characteristics of the theory limit the contributions of existing expectancy-valance research to understanding this phenomenon.

Loss aversion, prospect theory, and framing. Despite the intuitive appeal of the classic expectancy-value models of choice, it often falls short as a descriptive model of actual choice behavior in many situations. One of the limitations associated with expectancy-value theories is the implication that gains and losses of equivalent value should be viewed equivalently with respect to motivational force. That is, the motivational force associated with avoiding negative outcomes of a given value should be equivalent to achieving positive outcomes of the same value. However, a great deal of research suggests that this is often not the case. A large number of studies demonstrate that most individuals are more sensitive to losses than to gains. For example, consumers given the option of paying a 5¢ per gallon surcharge to pay for gas by credit card will elect to pay cash (Thaler, 1980). However, those same consumers will bypass an opportunity to gain a 5¢ per gallon discount for paying cash, instead choosing to pay by

credit card. Thus, despite the fact that the two scenarios are economically identical, the potential loss of a nickel was sufficient to sway the consumers to pay cash, but the potential gain of a nickel was not.

Kahneman and Tversky (1984) provided further evidence of the pronounced bias towards loss aversion. Participants were given the option to take part in a $10 bet on the toss of a fair coin. If the result of the toss was heads, the participant would win $10; if the result was tails, they had to pay $10. Most participants refused to take part in the bet, as the prospect of losing $10 was apparently more compelling than the prospect of gaining $10. Even with the option of winning $20 vs. losing only $10, most participants viewed this as an unattractive wager. Loss aversion can also be seen with respect to the value of objects one has in their possession. One example is provided by a study conducted by Kahneman, Knetsch, & Thaler (1991), in which one set of participants was given a coffee mug, then asked at what price they would be willing to sell the mug. Another set of participants was given the opportunity to buy the same mug and asked what price they would be willing to pay. Those already in possession of the mug requested an average selling price of $7.12, while those without the mug were only willing to pay $2.87. Thus, greater monetary value was requested to compensate for the loss of the mug than individuals were willing to invest to gain it.

Kahneman and Tversky's prospect theory (1979) was developed to account for numerous violations of expectancy-value theories that are frequently observed among decision makers. Prospect theory is based on the same general foundation of expectancy and value, but modifies the weighting of the expectancy and value terms in a manner intended better describe actual choice behaviors. These modifications have several

important implications. First, low probability outcomes are overweighted, while high probability outcomes are underweighted. This brings the theory's predictions more closely in line with research findings, such as that of Lichtenstein, Slovic, Fischoff, Layman, and Combs (1978), who found that individuals tend to overvalue low probability health risks (e.g., botulism) and undervalue higher probability risks (e.g., heart disease).

A second important implication of these modifications is that the value function is not linear, as the traditional expected utility models assume, but is S-shaped, being concave for gains and convex for losses. This value function is illustrated in Figure 1. Prospect theory's S-shaped value function proposes that increases in [positive or negative] value exhibit diminishing impact on subjective value. For example, the difference in subjective value between gains of $10 and $20 is perceived as being greater than the difference in subjective value between gains of $110 and $120, despite the fact that the difference in each case is $10. Additionally, as illustrated in Figure 1, the value function is steeper in the domain of losses than in the domain of gains. This proposes that the displeasure (i.e. negative value) associated with losing a given amount is greater than the pleasure (i.e. positive value) associated with gaining that same amount. It is in this way that prospect theory accounts for the strong tendency toward loss aversion that was discussed above.

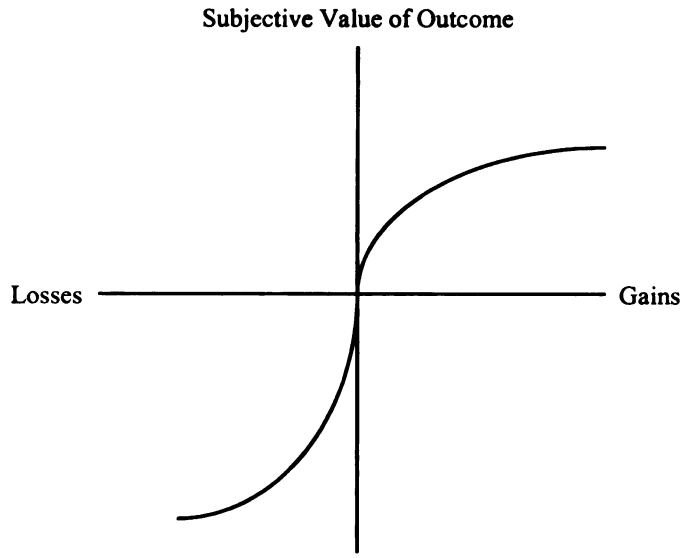


Figure 1. Prospect theory's hypothetical value function

Another important aspect of prospect theory concerns the frame of reference that individuals adopt when making a decision. The classic expected utility models assume that decision makers evaluate the options from a neutral reference point. However, prospect theory proposes that individuals can view any given decision problem from multiple reference points, which influence whether the various outcomes of a decision are seen as gains or losses. Which of the possible reference points a decision maker adopts can be influenced by a number of factors, such as norms, habits, and personal characteristics. Additionally, one of the most potent influences on the frame of reference that a decision maker adopts is the manner in which the decision problem and/or options are presented, which is typically referred to as *framing*. Tversky and Kahneman (1981) argue that, in the same way that changes in visual perspective can change the apparent size of an object, changes in framing can influence the relative desirability of the decision options.

To make this discussion more concrete, consider the following problem (the "Asian disease" problem), which is the prototypical decision problem used in research on prospect framing:

> Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:
>
> (Gain framed prospects):
> Option A: If this program is adopted, 200 people will be saved.
> Option B: If this program is adopted, there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved.
> (Loss framed prospects):
> Option A: If this program is adopted, 400 people will die.
> Option B: If this program is adopted, there is a 1/3 probability that nobody will die, and a 2/3 probability that 600 people will die.

In the typical study, participants are presented with the decision problem, followed by the options framed either as gains or losses. Those presented with the options framed as gains typically risk averse, choosing prospect A. Those presented with the options framed as losses are typically more risk taking, choosing prospect B. This reversal in preference occurs despite the fact that the two sets of options are, in fact, equivalent with regard to the actual probabilities, as well as the objective gains and losses associated with them. Thus, based on the classic expected utility models, decision makers should not demonstrate any meaningful difference in preference for the options across the two framing conditions, but the results of numerous studies provide resounding evidence that such shifts in preference do occur as a function of prospect framing.

This line of theory and research has some interesting implications for the allocation of resources to competing goals. Drawing from this research, one might

expect that the framing of the goals may play a prominent role. More specifically, if the objective value associated with each goal is similar, but one goal is framed as a loss while the other is framed as a gain, prospect theory suggests that greater subjective value would be associated with the loss-framed goal and, therefore, it should receive priority. Further, given the risk seeking associated with loss-framed decisions, this may even be the case when the likelihood of achieving the goal is relatively low. The relevance of this research for understanding the process by which individuals pursue multiple competing goals will be discussed in greater detail later. However, despite the important insights that this research can provide concerning multiple-goal self-regulation, the existing body of research on classical decision theories suffers from a number of limitations that restrict its ability to provide a more complete account of how individuals prioritize among competing goals dynamically over time. These limitations are discussed below.

Limitations of classical decision theories. Despite the relative success of research on classical decision theories at predicting individuals' preferences and choices, this body of research tends to display a number of limitations that reduce the extent to which it informs the issue of current concern – how individuals allocate their resources to competing goals over time. One such limitation is that these studies have tended to focus upon more distal aspects of motivation and behavior, such as choices made *prior to* task engagement, which typically has only indirect effects on action *during* task engagement (Kanfer, 1991). That is, motivational force may bear most of its influence on factors such as goal acceptance or goal commitment, which in turn influence factors that lead to actual behavior during task engagement. Mitchell and Daniels (2002) made a similar distinction between *pre-action* and *on-line* influences on motivation, stating that much of the VIE

research is focused on the former. Consideration of theories with more explicit focus upon proximal motivation processes may help to understand factors that influence the initiation and execution of action *during* task engagement.

The distinction between distal and proximal motivational processes is important because the same construct can have distinctly different impacts on distal and proximal motivation systems (Kanfer, 1991). For example, high self-efficacy expectations (i.e. confidence in one's ability to perform a given action) have been shown to have positive impacts on motivation through its influence on distal processes, such as goal setting and goal acceptance (Bandura, 1996; Locke & Latham, 1990). However, it has also been suggested that high self-efficacy can have a detrimental effect on proximal motivation processes (e.g., Kanfer, 1991; Powers, 1991). For example, Powers (1991) suggested that high self-efficacy may lead individuals to underestimate the discrepancy between their goals and performance, resulting in decreased motivation and decreased performance. Indeed, Vancouver et al. (2001) found positive relationships between self-efficacy and self-set goal levels and goal acceptance, but found a negative relationship between self-efficacy and performance when examined within-person. While some questions have been raised concerning the validity and generality of the phenomenon observed by Vancouver et al. (e.g., Bandura & Locke, in press; Schmidt, Chambers, & DeShon, in progress), it nonetheless illustrates the need to consider proximal motivational processes that influence on line task engagement and action. With respect to the pursuit of multiple goals over time, most research from the expectancy-valance perspective would suggest that high expectancy of success for one goal would lead to greater priority for that goal. However, it may also be the case that such a relationship

would be found when focused upon the more distal motivational processes, such as initial goal selection and goal prioritization. But when focused upon more proximal motivational processes occurring on-line task engagement, high expectancy of success may lead one to shift their attention to goals that currently have lower expectancy of success, as these goals are in need of greater attention in order to be achieved. [1] The extant body of research based on expectancy-valance theories does not provide a clear understanding of how such a process might unfold.

A related, and perhaps more fundamental, limitation of much of the existing research on classical decision theories is their static or episodic nature. These studies often neglect temporal aspects of motivation, instead focusing on motivational tendencies within a limited temporal episode. As noted by Connolly and Ordóñez (2002), the decision problems typically addressed in these studies are single-choice events – that is, one-time decisions with a static probabilistic environment. Hastie (2001) refers to such decision problems as one-shot, well-defined decisions, with most current decision theories targeted at the choice of one action at one point in time. Such decisions are terminal in the sense that, once made, they are not revisited. This situation is fundamentally different from a broad range of dynamic decision tasks, such as the continuous pursuit of two or more competing goals over time. On dynamic tasks of this nature, individuals make choices at various points in time concerning where to focus their attention and actions. They must also continually revise these decisions in response to

[1] Given the limited and potentially conflicting theoretical and empirical perspectives on the relationship between self-efficacy/expectancy in a multiple-goal context, it is difficult to propose and sufficiently support hypotheses concerning self-efficacy and resource allocation. Additionally, such efforts would divert the focus from the primary constructs of interest in this study. For these reasons, self-efficacy was not formally incorporated into the theoretical model and hypotheses. However, its role in goal prioritization was examined in an exploratory manner to provide guidance for future research.

changes in the situation occurring due to their own actions, as well as changes that occur due to external influences. Such dynamic decision problems are common and inescapable in many – if not most – domains, as the environment is rarely static, and the decisions that are made at one point in time alter the environment and thus impact the decisions that are made later (Brehman, 1992; Diehl & Sterman, 1995; Luce, 1995). The distinction between static and dynamic contexts may be of critical importance for many aspects of motivation and decision-making. For example, Hollenbeck, Ilgen, Phillips, and Hedlund (1994) demonstrated that the influence of decision frame on risky decision making – the hallmark of prospect theory – may be very different in dynamic contexts than in the static contexts in which it is typically examined.

Because of the static, one-shot nature of most research on classical choice theories, it does not provide a clear account of behavior in response to a pattern of events that change over time – the dynamic interaction between individuals and the environment (Kanfer, 1991; Vancouver, in press). Research taking a static approach may be relatively well applied to contexts in which the problem posed to individuals is "Which task will I perform?" However, in the multiple goal situations of interest in this study, the issue is more complicated. The question is not simply which goal to pursue, as individuals are tasked with pursuing multiple goals over the same time period – thus, the answer to this question is "both." The more important questions are, given that one has multiple goals to pursue, *how* will they do so, *when* will they choose to focus their attention and actions on the pursuit of one goal rather than another, when will they choose to switch attention from one goal to another, and why will they do so? Extant research on classical decision theories doesn't provide much guidance in predicting or explaining this type of

continuous behavior that includes *changes* in the direction of behavior that are so characteristic of human behavior outside confined, experimentally induced situations (Atkinson & Birch, 1978; Kanfer, 1991; Kuhl & Atkinson, 1984; Luce, 1995).

A third limitation concerns the rational nature of classical decision theories. For example, a great deal of debate has emerged concerning the multiplicative function that is proposed by VIE theory, which many argue is unnecessarily complex and does not reflect true decision processes (e.g., Harrell & Stahl, 1986; Stahl & Harrell, 1981). This research indicates that, when actually making decisions, individuals often do not to go through the rational, deliberative process of judging valance, instrumentality, and expectancy of the various options, and combining them multiplicatively to determine which option possess the greatest subjective expected utility. For example, Stahl and Harrell (1981; Harrell & Stahl, 1986) found that most individuals incorporated expectancy and valance information in a manner more consistent with an additive than a multiplicative model. Prospect theory makes some important modifications to the expected value perspective to account for some of the well-recognized deviations from rationality that are often observed, but remains based upon the same logic and structure of the expected value approach and, thus remains subject to many of the same limitations of rationality.

The problem with the rationality of VIE theory is exacerbated by the static nature of the research. In static situations in which a single choice is made and sufficient time exists to carefully reflect upon the valance, instrumentality, and expectancy of the various options, individuals may utilize the rational approach proposed by VIE theory. However, during on-line task engagement, such a deliberative approach to decision making is less

likely, as it requires a relatively large amount of one's time and attentional resources, resources that are employed for actual engagement of the task at hand (Kanfer & Ackerman, 1989). Indeed, Kanfer and Ackerman (1989) suggest that the utilization of such conscious, deliberative, and resource intensive processes during task engagement diverts resources away from the task itself, resulting in performance decrements. Thus, in addition to the questions raised concerning the extent to which individuals are rational maximizers within the domain of tasks examined in traditional expectancy-valance studies, further questions can be raised concerning whether such strategies guide prioritization decisions in dynamic contexts in which multiple goals are pursued over time.

Despite the long and prominent history of the classical decision theories, the limitations detailed above suggest that the existing research on these theories may provide some useful insights, but is nonetheless limited in its contributions to understanding the dynamic pursuit of multiple goals over time. As organizational researchers become increasingly interested in complex and dynamic phenomena, our research needs to become increasingly dynamic, modeling the interplay between people and contexts that change continually over time. In a recent review of the motivation literature, Mitchell & Daniels (2002) cited understanding the mechanisms involved in the allocation of time and attention across varying tasks as a primary issue that needs to be addressed by motivational theories and research. Understanding this phenomenon necessitates consideration of the dynamic nature of behavior and the underlying processes involved. As will be discussed next, scholars have begun to devote greater

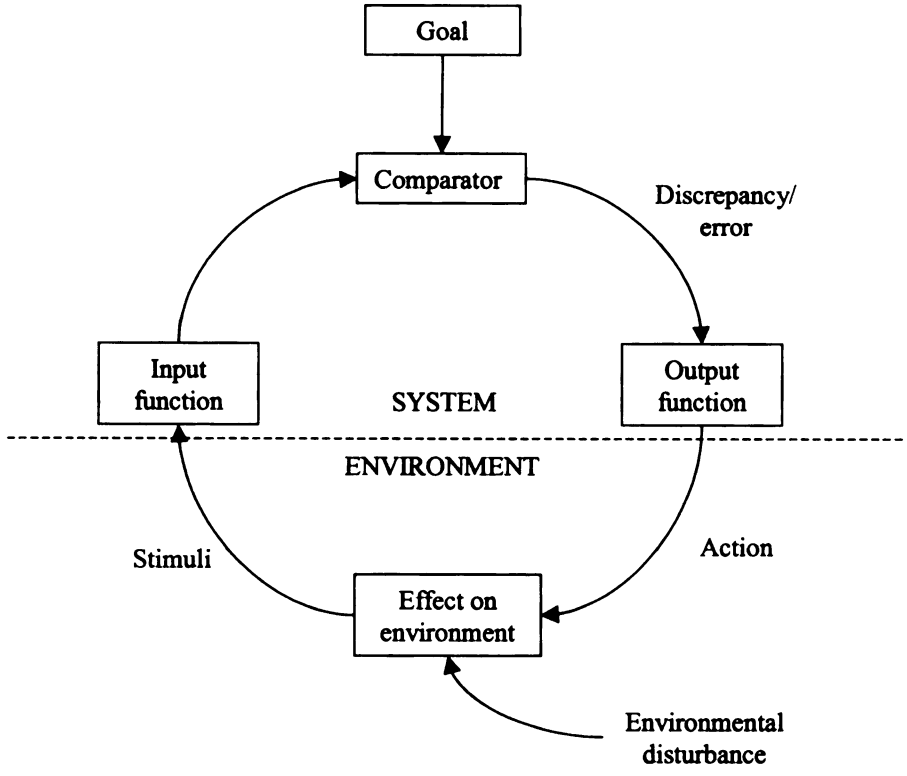
attention to the dynamic aspects of behavior over time. This work may provide further guidance concerning the dynamic prioritization of multiple goals over time.

Control theory

Based on the premise that much of human behavior is goal-directed (e.g., Austin & Vancouver, 1996; Locke & Latham, 1990), self-regulation theories seek to explain the *dynamic process* by which goals are translated into action. The two most prominent theories of self-regulation – control theory (e.g., Carver & Scheier, 1998; Klein, 1989; Powers, 1973) and social cognitive theory (e.g., Bandura, 1997) – both propose that discrepancy reduction plays a fundamental role in motivating or guiding human behavior. Goals serve as standards or referents by which behavior is directed and evaluated. Action is initiated as a means to reduce discrepancies between the goal state and one's current standing relative to that goal. If subsequent evaluations reveal that a discrepancy remains, then further action is enacted.

Figure 2 displays a schematic depiction of a single negative feedback loop, which is considered the basic unit of control (Carver & Scheier, 1998; Miller, Galanter, & Pribrum, 1964; Powers, 1973). The input function acts as a sensor, detecting the current state of the environment. A comparison is then made between the current state and the desired goal state. The discrepancy or error that results from this comparison triggers an output function, which is typically behavior of one sort or another that is intended to reduce the discrepancy. This output changes the state of the environment. In addition, forces outside the control system itself will frequently create changes in the environment that are independent of the changes resulting from the control systems' output function. The input function again checks the status of the environment, and the process continues.

Figure 2. Basic negative feedback loop



From the control theory perspective, primary consideration of multiple goals has come from the concept of goal-hierarchies. Both control theory and social cognitive theory propose that goals are structured hierarchically, such that attainment of superordinate goals is contingent upon attainment of subordinate goals. For example, one may possess a distal goal to graduate from college. As a step toward accomplishing this goal, he/she must attain the more proximal subordinate goal of passing introductory psychology. Passing introductory psychology requires attaining the goal of adequate performance on next week's exam, which requires studying the material to be covered on the exam, etc. Thus, to achieve a particular goal, subordinate goals must be attained, each of which has subordinate goals of its own, down to the lowest level of changes in muscle tension (Carver & Scheier, 1998; Powers, 1973). Although the lowest levels of the goal hierarchy are beyond the typical interest of organizational researchers,

consideration of multiple levels at higher points in the goal hierarchy has proven beneficial (e.g., Campion & Lord, 1982; Lord & Levy, 1994).

While the notion of hierarchically arranged goals is of great importance in understanding and predicting behavior, self-regulatory theories have given little consideration to the interactions among goals at the *same* or *similar* levels in the hierarchy. Although goal hierarchies are necessarily multiple-goal phenomena, they are generally discussed as mechanisms for describing movement toward a single superordinate goal and, therefore, fail to capture the full complexity of human behavior. Competing goals can exist at any level in the hierarchy, presenting unique challenges that most self-regulatory theories fail to address. To understand the behavior of individuals under a broader range of situations that individuals frequently encounter, it is important to consider prioritization among goals at multiple levels of the hierarchy.

Despite the limited formal consideration of the simultaneous pursuit of multiple competing goals, control theory remains a powerful conceptual foundation for addressing these issues. Given the prominent role of discrepancies as a driving force of behavior, the control theory perspective suggests that a key determinant of prioritization in multiple goal contexts is the relative magnitude of the discrepancies among the goals in conflict. In his 1973 book on perceptual control theory, Powers argued that goal conflict results from responses to disturbances in two or more control systems that are attempting to meet incompatible goals – the attainment of one control system's reference value can only come at the expense of the other. That is, the nature of the conflicting control systems is such that it is not possible (or is very difficult) for both systems to experience zero error

(i.e. no discrepancy) at the same time, as the *reduction* of error experienced by one system *increases* the error experienced by the other.

Powers further argued that such conflicts result in the output of both systems essentially canceling each other out, as the control systems find an equilibrium point. These equilibrium points, or "virtual reference points," give the illusion that both systems are striving toward some less stringent or less demanding and roughly equivalent standard. In other words, it will appear that a "compromise" has been reached among the conflicting systems when, in fact, both systems are continuing to seek the initial goals, but are counteracting each other's output, resulting in a more moderate and relatively equivalent output from each system than its true standard would dictate. According to this conceptualization, when external factors (environmental disturbances) impinge upon the target(s) of control and reduce the error experienced by one control system, the control system experiencing reduced error will relax, and greater output will be exerted in the direction of the goal experiencing *greater* error. Thus, based on Powers' theory, greater priority is given to the control system that is experiencing the *greatest* amount of error. If the situation reverses itself, such that the error or discrepancy is now larger for the opposing goal, the allocation of output will also be reversed. Beyond the relative error or discrepancy experienced by the control systems in conflict, Powers provides no further information concerning factors that result in greater priority being allocated toward one conflicting system or another.

Klein (1989) also offered a few propositions concerning the interplay of two goals at similar levels of the hierarchy. He proposed a control theory model of work motivation that integrated various theories of motivation such as goal setting theory

(Locke & Latham, 1990), VIE theory (e.g., Vroom, 1964), social learning theory (e.g., Bandura, 1986) and control theory (e.g., Carver & Scheier, 1982; Lord & Hanges, 1987; Powers, 1973). Like the field as a whole, he gave only limited explicit consideration to the issue of goal conflict and prioritization, but did offer a few propositions relevant to the phenomenon. Klein identified goal importance (i.e. valance) and discrepancies as both contributing to the resolution of goal conflict. Based on Klein's propositions, if one goal is seen as more important than another and both have equivalent discrepancies, the individual is likely to focus on the more important goal. On the other hand, if both goals are of equal importance, the individual is likely to focus on the goal with the *larger* discrepancy. The prediction in this latter case is consistent with Powers' (1973) proposition.

Review of empirical studies. While Klein (1989) and Powers (1973) have offered some limited suggestions concerning factors that influence prioritization, the scant empirical evidence is mixed. Kernan and Lord (1990) examined the role of goal-performance discrepancies, valances, and expectancies on the prioritization of goals on a dual-task under single- and multiple-goal conditions. This study was set up as a comparison between strict control theory predictions and more rational, expectancy-valance based predictions concerning the role of these three constructs in determining goal prioritization. They argued that predictions based on a strict cybernetic control theory framework would assert that goal priority should be driven by the differences in goal-performance discrepancies across tasks, whereas more rational theories of motivation hold that prioritization should be based on consideration of expectancy and

valance of goal attainment, in addition to goal-performance discrepancies. Kernan and Lord (1990) attempted to test these somewhat competing hypotheses.

Participants were presented with two clerical tasks, which they were to perform for three task trials. Subjects were provided with a difficult specific goal for either one or for both tasks. Additionally, as a manipulation of valance, subjects were given one entry into a $50 lottery for each goal that was attained at any point during the study (thus, multiple-goal subjects were eligible to receive two entries, one per task/goal). Under single goal conditions, subjects focused on the task for which the goal was provided, to the exclusion of the other. Under multiple goal conditions, a main effect for discrepancies was found, such that *smaller* discrepancies led to higher goal prioritization, operationalized as goal commitment and allocation of effort. Further, valance and discrepancy interacted in their effects on subsequent task prioritization. When valance was low, no priority system emerged – each goal was given roughly equal priority. However, when valance was high, the goal with the lower discrepancy was given higher priority.

A study by Locke et al. (1994) examined the role of goal commitment in determining goal priority. Participants were given conflicting goals of producing high quality products, or producing a high quantity of products. It was found that, when given goals for one mode of productivity and not the other, participants demonstrated greater commitment to and higher performance on that mode of performance. However, when given goals to perform well on both, resources were divided among the two and performance on each suffered as a result, when compared to single goal conditions. Again, under dual goal conditions, goal commitment predicted prioritization among the

conflicting goals. However, no effort was made to determine the antecedents of goal commitment in this study, leaving the question of why subjects were more committed to one goal than the other unanswered. Further, because the study examined only single-trial performance, it is not possible to determine the role of goal-performance discrepancies for determining prioritization. However, the finding that participants in the dual goal condition balanced their performance on the two tasks suggests that, within the single performance trial examined in this study, participants devoted greater attention to the task that had greatest discrepancy at any given time during the trial. Thus, the results of this study give indirect support to the contentions of Powers (1973) and Klein (1989) and contrast with the findings of Kernan and Lord (1990).

Vancouver (1997) conducted another study examining quality vs. quantity goals. Unlike Locke et al. (1994), Vancouver examined performance over multiple trials, allowing more direct examination of the influence of goal-performance discrepancies on subsequent goal prioritization. The experimental task consisted of a computerized stock market prediction task, in which participants chose stocks for a fictitious investment firm. Each trial, participants were asked to choose one stock from four alternatives based on five attributes provide for each available stock. In performing the task, participants were asked to satisfy two conflicting goals – maximize the return on investment (a "quality" goal) and minimize the time taken to choose each stock (a "quantity" goal). Participants were provided with the target values for each of these goals, which were equated on difficulty. Because choosing stocks more quickly meant less time was available to fully consider all available information (and vice versa), these two goals were in conflict. That

is, it would be very difficult for participants to simultaneously meet both the quantity and quality goal.

Because the goals were set by the experimenter and were constant throughout the study, goal-performance discrepancies were operationalized as past performance (computing the difference score of "past performance – goal" would merely subtract a constant from past performance, thus imparting no predictive advantage over simply utilizing past performance). As predicted, lower past performance on one goal led to higher subsequent performance on that task. That is, when participants performed more poorly on one task, resulting in *larger* discrepancies, they responded by increasing their focus on that task during the following trial.

The implication drawn from these results was that individuals allocated more resources towards whichever aspect of performance was most deficient, which is consistent with Powers (1973) and Klein's propositions, as well as the implications of Locke et al.'s (1994) results. However, the Vancouver study did not provide a *direct* test of that proposition, as he only reported the relationship between past and current performance on the same goal (i.e. past *quality* performance related to subsequent *quality* performance, past *quantity* performance related to subsequent *quantity* performance), prohibiting any direct conclusions about how *relative* discrepancies influence subsequent performance on the two goals. For example, it would be entirely consistent with the results of the Vancouver study to find that participants perform moderately poorly on the quality goal and even more poorly on the quantity goal during an early trial, then improve their performance on both goals on a subsequent trial. Additionally, participants in this situation could subsequently focus more heavily upon, and thus demonstrate greater

improvement on the quality goal – that is, they could focus and improve most on the task with the *smallest* discrepancy and still yield the results that Vancouver observed. Thus, by not examining the relationship between past-performance/discrepancies and subsequent performance on the opposing goals (i.e. past quality performance *as well as* past quantity performance related to *both* subsequent quality and subsequent quantity performance), the Vancouver study provides only an indirect and ambiguous glimpse into the role of relative discrepancies in prioritization when no superordinate goals are involved. These results also conflict with the observations of Kernan and Lord (1990) who found that, under high valance conditions, *smaller* discrepancies led to greater priority on the subsequent trial. Kernan and Lord found that this effect was moderated by valance. Unfortunately, valance was not accessed in the Vancouver study, which further inhibits a direct comparison between these results. However, as shall be discussed shortly, more careful consideration of valance, as influenced by superordinate goals, may provide a more coherent picture of this phenomenon.

Summary of control theory review. The theoretical and empirical works reviewed above aptly illustrate the ambiguities and inconsistencies regarding the prioritization of competing goals. The results of the Locke et al. (1994) and, more specifically, the Vancouver (1997) study provide some indirect support for Powers' (1973) argument that attention should be shifted to the goal with the largest discrepancy. In contrast, Kernan and Lord (1990) found that goal valance and discrepancies did in fact interact in determining goal prioritization, as had been suggested by Klein (1989). However, the nature of that interaction was opposite of what Klein had proposed. Recall Klein's argument that, when confronted with two competing goals of equivalent importance,

individuals would focus on the goal with the *greatest* discrepancy. However, Kernan and Lord found that this condition resulted in greatest attention being focused on the goal with the *smallest* discrepancy, not the largest.

Clearly, no consensus emerges from this literature regarding the factors that influence goal prioritization or the manner in which they do so. Goal-performance discrepancies appear to play a key role in subsequent prioritization, although conflicting results have emerged concerning the nature of their influence. The addition of valance and expectancy concepts by Klein (1989) and Kernan and Lord (1990) help to elaborate the phenomenon, yet have also led to discrepant results. These conflicting accounts illustrate the complexity of the phenomenon. It is unlikely that any one account is sufficient to explain the role of discrepancies in directing attention among competing goals. Rather, each account provides only a partial view of this complex phenomenon. What is needed is an understanding of the critical factors that influence prioritization among competing goals. While the existing theory and research indicates that discrepancies among the competing goals play a large role, it is important to understand additional factors that influence prioritization in conjunction with goal-performance discrepancies. Below, an elaborated model is proposed to provide a broader and more coherent picture of the process of self-regulation involving multiple competing goals.

An Elaborated Model of Multiple-Goal Self-Regulation

Model Overview

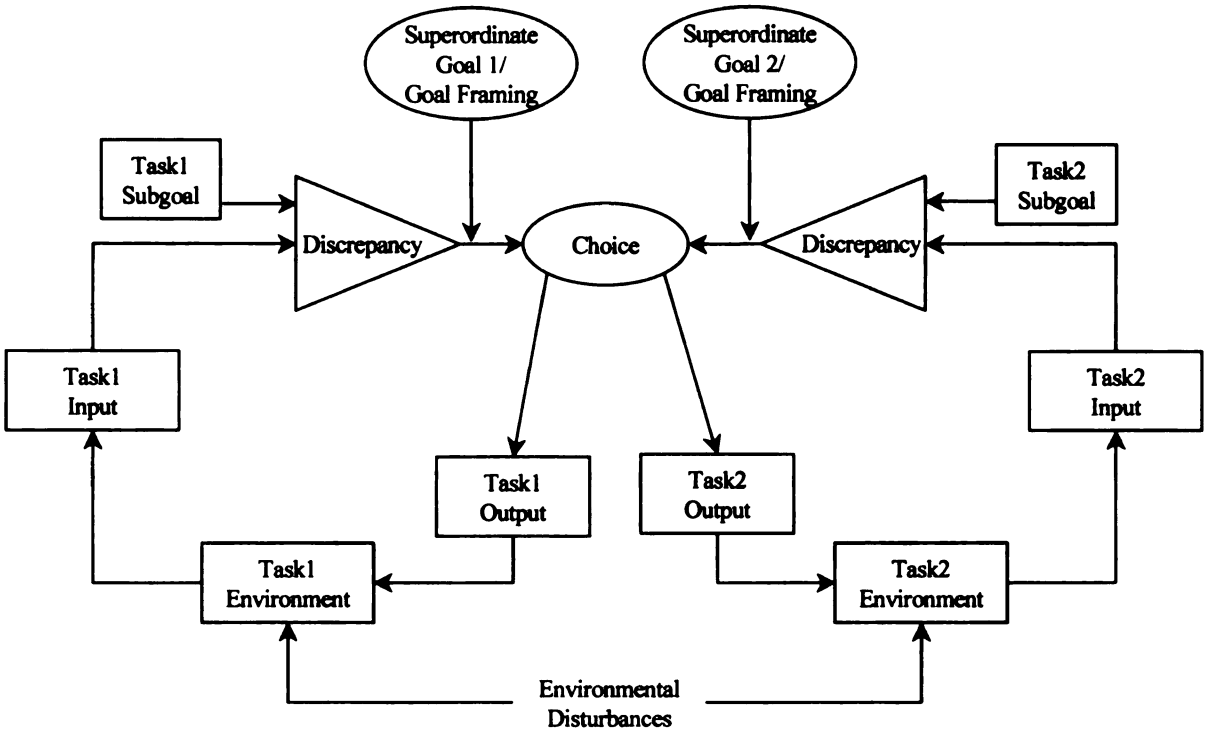
Figure 3 displays a model of dual-goal self-regulation. The model is dynamic in nature, depicting the process involved in the pursuit of two competing goals over time. The model incorporates the varying theoretical perspectives discussed above to explain

how individuals focus and shift their attention across the two competing goals dynamically over time. The focus of this model is on contexts in which the goals in question are competing in the sense that actions required for pursuing the two goals are incompatible. Thus, consistent with Allport's (1989) notion of selection-for-action, this model assumes that individuals can only focus attention on one goal or the other at any given point in time, but can shift attention back and forth between the two goals. The core of the model is the two feedback loops, one associated with each of two goals. For simplicity and to bound the scope of the present discussion, the goals are assumed to be fixed values – that is, they are not revised upwards or downwards as one progresses towards one goal or the other – although the model can readily be extended to include such goal revision phenomena.

The following discussion provides a brief overview of the model, which will be elaborated upon below. For each loop, there is an input function that detects the current status of the environment with respect to its goal. This input value for each loop is compared to its goal value. The result of this comparison is a discrepancy that can range from negative values (current status is lower than goal) to zero (current status and goal are equivalent) to positive values (current status is greater than goal). Consistent with existing control theory models (e.g., Klein, 1989; Powers, 1973), the current model proposes that these discrepancies influence the choice concerning which of two competing tasks to attend to at a given point in time. However, as will be discussed below, this model proposes that superordinate goals will influence the manner in which discrepancies lead to prioritization (e.g., whether one focuses on the goal with the larger or smaller discrepancy). This choice triggers the relevant output function, which serves

to change the state of the environment in a manner intended to reduce the discrepancy. Additionally, forces outside the individual can also create changes in the environment independently of the changes resulting from the output functions. The input functions again check the status of the environment, and the process continues.

Figure 3. A model of multiple-goal self-regulation.



The processes detailed in this model are inherently dynamic in nature, as the model predicts that the focus of attention over time as a function of changes in progress towards one's goals, coupled with the framing of superordinate goals. In multiple-goal contexts, such as that of interest in the current study, individuals are faced with a dynamic situation that evolves over time as a result of their own actions, as well as by external factors outside their scope of influence (i.e. environmental disturbances). Thus, in such contexts, individuals must continually monitor the situation as it unfolds, and

make allocation decisions in concert with the changing situation. Indeed, the explicit consideration of dynamic relationships of this nature is one of the hallmarks of this paradigm (e.g., Vancouver, 2000). The hypotheses proposed below represent snapshots of this dynamic process, focusing on overall patterns of behavior emerging from this dynamic process. By incorporating changes in goal-performance discrepancies as a key factor influencing changes in the focus of action over time, the history of the system is taken into account in predicting the focus at a given point in the course of the dual-goal pursuit.

In addition to the inherent focus upon processes that *unfold* over time that characterizes the primary study hypotheses, self-regulatory processes may not function in a consistent manner across all time points. Rather, the processes themselves may evolve, such that the influence of one construct on another changes in magnitude and/or direction over time. Thus, examining the role of time represents an important step towards developing more comprehensive and valuable theories of self-regulation. Unfortunately, insufficient work exists to propose unambiguous and theoretically justifiable hypotheses concerning how self-regulatory process may change over time in a multiple-goal context. However, such additional dynamics are examined in post-hoc exploratory analyses, which can help provide valuable information for future work in this area.

Goal Hierarchies and Prioritization

An important aspect of the model is the role of superordinate goals, which are proposed to influence prioritization and the shifting of action in multiple goal pursuits. More careful consideration of the role of goal hierarchies may help reconcile some of the inconsistencies that have characterized the extant literature. The interplay between distal

superordinate goals and more proximal subordinate goals is of central concern in numerous models of motivation. For example, Raynor & Roeder's (1987) expanded version of Atkinson's (1957) theory of achievement motivation asserts that individuals are more motivated to succeed on the task at hand when they believe that such success contributes to the attainment of related future goals. Similarly, Eccles (1993) proposed that "utility value" – the perceived usefulness of a given task for the attainment of a future goal – is an important determinant of motivation. Thus, when one perceives high performance on a given task to be instrumental to the attainment of a distal superordinate goal, motivation to perform well on the subordinate task should be higher than when performance on the subordinate goal is not perceived to contribute to attaining a superordinate goal.

Given the functional link between goals at varying levels in the hierarchy, consideration of the superordinate goals to be achieved via the subordinate goals in conflict should aid in understanding the manner in which discrepancies influence prioritization. Conceptual support for this proposition can be found in Hyland's (1987; 1988) control theory model of motivation, in which the concept of error sensitivity plays a prominent role. Hyland discussed the concept of error sensitivity in explaining the intensity of goal-seeking behavior. In brief, error sensitivity refers to the level of response to a given level of discrepancy. It is analogous to a "gain" knob that amplifies (or reduces, as the case may be) the discrepancy, thereby causing reactions to a given "objective" level of discrepancy to be more or less extreme. With low error sensitivity, relatively small discrepancies have limited behavioral consequences – discrepancies are more-or-less "tolerated" within certain bounds. However, with high error sensitivity,

even small discrepancies can lead to strong reactions. Hyland further argued that error sensitivity reflects the value or importance of the goal in question, as influenced by superordinate goals. Thus, from a multiple-goal perspective, error sensitivity should influence how individuals prioritize between goals based on discrepancies. If one goal has greater error sensitivity than another, then one should be more inclined to focus on pursuing the goal with greater sensitivity when faced with a discrepancy of a given size. This should result in that goal being more tightly controlled – discrepancies are not allowed to get too large before engendering responses to reduce them. In contrast, discrepancies on a goal with lower error sensitivity would need to be relatively large before provoking actions to reduce them. Thus, Hyland's theory suggests that superordinate goals should influence the manner in which discrepancies among competing goals affect prioritization.

While the model suggests that superordinate goals play an important role in goal prioritization, it is not sufficient to merely consider the presence or absence of superordinate goals that are served by the goals in competition. Rather, it is important to also identify *characteristics* of superordinate goals that influence prioritization, alone or in conjunction with goal-performance discrepancies. While there are many characteristics that may be influential, a particularly important factor to consider is whether the superordinate goal or goals represent approach-oriented pursuits – in which the superordinate goal represents a desired end-state to be approached – or avoidance-oriented pursuits – in which the superordinate goal represents an undesired end-states to be avoided. The distinction between approach and avoidance motivation is supported by decades of theory and research and is given a prominent role in both "classical" (e.g.,

Atkinson, 1957; James, 1890; Lewin, 1935; McClelland, 1951; Murray, 1938) and "contemporary" (e.g., Carver & Scheier, 1998; Elliot, 1999; Higgins, 1996) theories of motivation.

The Role of Superordinate Goal Framing in Dynamic Goal Prioritization

The literature on loss aversion and framing effects discussed earlier demonstrates the divergent and asymmetric nature of a broad range of phenomena resulting from approach and avoidance framing. Drawing on this diverse and convergent body of literature, the current model proposes that the framing of superordinate goals will have an important impact on the relationship between the discrepancies on each goal and the resulting focus on one goal or the other. Consistent with existing control theory models of self-regulation, it is proposed that the relative magnitude of discrepancies for the goals in competition will play an important role in determining which goal is focal. However, I hypothesize that framing of the superordinate goals that each task serves will moderate the nature of that influence. Thus, while previous research has focused in large part upon the main effects of discrepancies (e.g., Kernan & Lord, 1990), this moderation hypothesis suggests that the superordinate goal framing will heavily influence this relationship. The rationale and expected nature of this interaction will be discussed in greater detail below.

Hypothesis 1: The framing of the superordinate goals will moderate the relationship between discrepancies and prioritization.

Single superordinate goal. Given the presence of a single superordinate goal – that is, the presence of a superordinate goal for one task but not the other – it is expected that

the majority of actions will be directed toward the task with the superordinate goal, with relatively little switching between tasks. This hypothesis is consistent with the single-goal results of Kernan and Lord (1990), who found that the provision of a lottery entry for meeting the goal on only one of the two tasks resulted in almost complete allocation of resources to that task. The presence of the superordinate goal affords that task greater importance than a task for which meeting the goal provides nothing in the way of meeting more distal, superordinate goals. Said differently, the absence of a superordinate goal provides little incentive to expend effort toward the attainment of that goal when that effort could be directed toward goals whose attainment leads to desired outcomes (or the avoidance of undesired outcomes). Additionally, when the superordinate goals are provided or externally set, they can provide cues regarding the intended priority of the tasks. Indeed, the directing quality of externally set goals is a primary rationale for goal setting interventions (e.g., Locke & Latham, 1990). Thus, when incentives (be they positive or negative) are provided for the attainment of one task and not others, they imply that the rewarded task is more important than alternative tasks. It is not expected that the approach or avoidance framing of the superordinate goal should bear much influence in this situation – rather, it is the mere presence of a superordinate goal on one task, coupled with the absence of a superordinate goal on the other, that is likely to yield the expected effects.

Hypothesis 2: With a superordinate goal for only one task, the task with the superordinate goal will receive greater priority, with little switching between tasks.

Approach- and avoidance-framed superordinate goals. When individuals are confronted with two competing goals in which one serves an approach-framed superordinate goal and the other serves an avoidance-framed superordinate goal, it is expected that the avoidance-framed goal will receive greater priority. This expectation is driven in part by the large amount of evidence emerging from the literature reviewed above concerning the overwhelming tendency of individuals to be averse to losses and negative outcomes more generally (e.g., Kahneman & Tversky, 1984; Thaler, 1980). Thus, individuals are likely to have greater concern with avoiding the undesired consequences of failing to meet the avoidance-framed goal than the desired consequences of meeting the approach-framed goal. Discrepancies relevant to the avoidance-framed task are likely to be experienced as more severe than discrepancies of equivalent size on the approach-framed task. In terms of Hyland's control theory model (1988), avoidance-oriented pursuits are likely to possess greater error sensitivity.

Additional evidence for this expectation emerges from research on regulatory focus (e.g., Freitas, Liberman, Salovey, & Higgins, 2002; Higgins, 1997; Higgins, Shah, & Friedman, 1997). While regulatory focus encompasses more than the framing of goals in gain/approach or loss/avoidance terms, there is a great deal of overlap in the concepts, particularly with respect to the situational manipulations of regulatory focus. For example, Freitas et al. (2002) conducted a series of studies designed to determine if regulatory focus influences preferences for when to initiate action. In the first study, participants were asked to indicate when they would prefer to begin working on an essay that was required as part of a fellowship application. The instructions emphasized either

attaining the fellowship (promotion focus) or avoiding being rejected for the fellowship (prevention focus). Those with the prevention focus preferred writing the essay earlier than those with the promotion focus. In a second study, participants were asked to indicate when during the experimental session they preferred to begin working on an anagram task, which was famed in either approach terms (i.e. participants began the anagram task with $1 and gained $1 for each correct answer) or in avoidance terms (i.e. participants began the anagram task with $7 and lost $1 for each incorrect answer). Those receiving the prevention framing preferred to begin the anagram task earlier in the experimental session than those receiving the promotion framing. Finally, in a third study, participants were challenged with solving 20 anagrams, half of which were framed in promotion terms (participants gained money for solving these anagrams correctly) and half were framed in prevention terms (participants lost money for solving these anagrams incorrectly). Consistent with the other two studies, a prevention focus led to a preference for earlier completion, as participants tended to perform the prevention-framed anagrams before the promotion-framed anagrams.

Additional research has found that individuals tend to persist longer on prevention-focused tasks, demonstrating a hesitance to switch to alternative activities (e.g., Liberman, Idson, Camacho, & Higgins, 1999; Shah & Higgins, 1997). For example, Liberman et al. (1999) had participants perform a communication task in which they had to provide descriptions of three abstract figures – the descriptions had to be detailed enough so that another person could correctly select the three figures from among 10 abstract figures solely based on the description. Those in the promotion focus condition started with no points and gained two points for each figure that was described

adequately. Those in the prevention focus condition started with six points and lost two points for each figure *not* described adequately. When given an option to switch to a different task before completing the figure descriptions, those in the prevention focus condition were less willing to switch to a different task than those in the promotion focus condition. This finding are consistent with Higgin's (1997) assertion that a prevention focus facilitates viewing an adopted goal as a necessity, rather than an opportunity, leading to a regulatory process in which one seeks to avoid failing short of their obligations.

Shah and Higgins (1997) provide additional support for the assertion that prevention-framed goals are viewed as necessities, whereas promotion-framed goals are viewed as opportunities. They argued that a promotion focus should induce a strategy wherein the greatest opportunity for accomplishment is provided by pursuing goals with the highest expected utility; that is, those that result in the maximum product of expectancy and value, consistent with the typical expectancy-valance theory contention. In contrast, because prevention-framed goals are seen as duties, obligations, or necessities, if the value of the goal is high enough, commitment to the goal should be high, with relatively little consideration given to the likelihood of achieving the goal. Likewise, goals with little value are likely to be pursued only if the expectancy of success is very high. Thus, with a prevention focus, the influence of expectancy is minimal when the goal is highly valued and at it's maximum when the goal's value is low. The results of four studies found support for the proposed three-way interaction between regulatory focus, goal value, and expectancy of success. These results suggests that, with a promotion focus, valued goals are seen as opportunities that are most likely to be pursued

if expectancy of success is also high, whereas with a prevention focus the same goals are seen as necessities that must be pursued regardless of likelihood of success.

Given the similarities between regulatory focus and more general approach and avoidance concepts, a similar phenomenon is expected to occur with regard to approach- and avoidance-framed tasks, such that individuals will demonstrate preference for working on the avoidance-framed task. Additionally, they are expected to demonstrate greater unwillingness to switch their focus from the avoidance-framed task to the approach-framed task. This pattern should be most pronounced when discrepancies exist on the avoidance-framed goal, as the threat of loss is accentuated under such conditions.

> Hypothesis 3: With two competing goals serving an approach-framed superordinate goal and an avoidance-framed superordinate goal, respectively, the avoidance-framed goal will receive greater priority. This tendency will be most pronounced when discrepancies exist on the avoidance-framed goal.

Two approach-framed superordinate goals. When confronted with two competing goals in which both serve *approach*-framed superordinate goals, it is expected that prioritization will be influenced by the relative discrepancies among the competing goals, such that greater priority will be given to the goal with the *smallest* discrepancy. That is, individuals are expected to direct their actions toward the pursuit of the goal that is closest to being attained. Research on framing effects demonstrates that individuals tend to view positively framed options as opportunities. Likewise, research on regulatory focus also suggests that promotion-focused goals are seen as opportunities (e.g.,

Liberman et al., 1999; Shah & Higgins, 1997). In a situation in which both superordinate goals are approach-framed, the greatest opportunity is presented by the goal that is closest to its standard. This expectation is consistent with research by Shah and Higgins (1997), who found that individuals were most likely to pursue opportunities that had the greatest combination of value and chance of success. In this condition of the current study, the value of success is set to be equivalent and expectations of success should be higher for the goal with the smallest discrepancy – thus, the goal with the smallest discrepancy presents the greatest combination of value and chance of success. It should also be noted that this scenario closely matches that examined by Kernan and Lord (1990). Recall that in their study, participants in the high-valance condition could gain one entry into a lottery for each of their two task goals that they met. Thus, for both tasks, achieving their subordinate goals (i.e. meeting an assigned performance level) led to the attainment of a desired – that is, an approach-oriented – end-state (i.e. a lottery entry). The results of their study indicated greater prioritization was given to the task with the *smallest* discrepancy, as is predicted here.

> Hypothesis 4: When both competing goals serve *approach*-framed superordinate goals, prioritization will be influenced by the relative discrepancies among the goals in competition, such that greater priority will be given to the goal with the *smallest* discrepancy.

Two avoidance-framed superordinate goals. The opposite pattern of results is expected to appear when individuals are confronted with two competing goals in which

both serve *avoidance*-framed superordinate goals. More specifically, it is expected that greater priority will be given to the goal with the *largest* discrepancy. A large body of research demonstrates the strong desire to avoid losses (e.g., Kahneman & Tversky, 1984; Kahneman, Knetsch, & Thaler, 1991; Thaler, 1980). Related research on framing effects demonstrates that individuals tend to view negatively-framed options as threats and will make objectively irrational decisions to avoid the losses these threats entail (e.g., Highhouse & Paese, 1996). Under the current scenario, the greatest threat or potential for loss is posed by the goal with the largest discrepancy. Therefore, it is expected that individuals will focus on whichever goal is furthest from its standard.

> Hypothesis 5: When both competing goals serve *avoidance*-framed superordinate goals, prioritization will be influenced by the relative discrepancies among the goals in competition, such that greater priority will be given to the goal with the *largest* discrepancy.

No superordinate goals (control). A similar pattern of results is expected when dealing with two competing goals in which *neither* is associated with a provided superordinate goal – that is, the experimental manipulation does not provide any external superordinate goals that are to be achieved through the attainment of the task goals. This situation closely matches the experimental context in both the Locke et al. (1994) and Vancouver (1997) studies. In both these studies, participants were provided with goals for both quality and quantity, which are conceptually analogous to the subordinate goals in the present discussion. However, neither study provided superordinate goals that could

be obtained through the achievement of the subordinate goals. Thus, participants may have inferred that their *duty* in the experiment was to obtain both goals – that is, rather than viewing the attainment of these goals as an *opportunity* to obtain some other valued superordinate goal, they may have viewed *failure* to meet the goals (or make a good-faith effort to do so) as failing to meet their obligations as an experimental participant. In a regulatory-focus framework, the goals may have both been construed as prevention-focused. From a more general approach-avoidance framework, both goals may have been represented as part of avoidance-goal pursuits – that is, achieving the assigned performance standards (subordinate goals) may have been seen as a means of avoiding being a poor participant. Additionally, some may have viewed failure to meet the goals as an indication of low ability and, thus, viewed such failure as a threat to their self-esteem. In this case, as well, pursuit of both provided standards may have been seen as a means to satisfy avoidance goals.

> Hypothesis 6: When no superordinate goals are provided for either goal, prioritization will be influenced by the relative discrepancies among the goals in competition, such that greater priority will be given to the goal with the *largest* discrepancy.

The Role of Approach and Avoidance Temperaments in Dynamic Goal Prioritization

While the previous discussions focused on approach and avoidance as brought about by situational factors, such as the framing of the information, individual differences in approach and avoidance tendencies have long been of interest to psychologists, as

well. A number of theoretical approaches have given consideration to individual differences in approach and avoidance tendencies, with most considering approach and avoidance tendencies as two largely independent constructs. Examples of such approaches abound. For example, Higgins (1997) has proposed that the regulatory focus construct is *both* an individual difference and is influenced by situation cues. A great deal of support has been found for this "state *and* trait" view of regulatory focus, as relationships found when regulatory focus is examined as an individual difference typically parallel those that are found when regulatory focus is brought about by situational factors. Higgins (1997) contends that differences in regulatory focus can be due to a broad range of factors, such as the history of one's caretaker-child interactions (e.g., Higgins & Silberman, 1998).

In his theorizing on the *behavioral activation system* (BAS) and the *behavioral inhibition system* (BIS), Gray (1990) also proposed individual differences in approach and avoidance tendencies. Gray's work proposes that the BAS and BIS represent two distinct conceptual nervous systems. The BAS *facilitates* behavior and produces positive affect, whereas the BIS *inhibits* behavior and produces negative affect. Research on BAS and BIS shows that BAS is associated with sensitivity (i.e. affective and behavioral response) to rewards, whereas BIS is associated with sensitivity to threats such as impending punishment (e.g., Carver & White, 1994; Fowles, 1993). Other researchers have developed converging lines of reasoning in arguing, like Gray, that physiological differences in facilitative and inhibitory motivational systems represent a fundamental basis for the structure of personality (e.g., Cloninger, 1987; Newman, 1987; Zuckerman, 1991).

A number of personality theorists have focused on similar individual differences in affective dispositions. For example, positive emotionality has been proposed as a tendency to experience positive emotions and to approach life with a positive outlook, whereas negative emotionality has been proposed as a tendency to experience negative emotions and approach life with a negative outlook (e.g., Tellegen, 1985; Watson & Clark, 1993). Positive emotionality has been associated with a number of diverse outcomes such as satisfaction with one's interpersonal and romantic relationships (e.g., Robins, Caspi, & Moffitt, 2000), sensitivity to signals of incentive-reward (e.g., Depue, Luciana, Arbisi, & Collins, 1994), and altruism (e.g., Krueger, Hicks, & McGue, 2001). Negative emotionality has been associated with outcomes such as childhood and current maladaptation (e.g., Shiner, Masten, & Tellegen, 2002), changes in competence across adulthood (e.g., Harker & Keltner, 2001), unhappiness with relationships (e.g., Robins, Caspi, & Moffitt, 2000), and sensitivity to signals of punishment (e.g., Depue, Luciana, Arbisi, & Collins, 1994).

The Big Five taxonomy of personality (e.g., McCrae & Costa, 1999; Goldberg, 1993) also contains constructs that can be conceptually mapped onto the approach and avoidance distinction. The dimension of neuroticism is associated with characteristics such as emotional instability, insecurity, and worry, characteristics that are conceptually similar to other avoidance-relevant personality constructs. The construct of extraversion is associated with characteristics such as optimism, activity, and sociability, characteristics that hint at its commonality with approach-relevant personality constructs.

While these constructs originate from varying theoretical perspectives, considerable conceptual and empirical overlap has been noted. Recent work by Elliot

and Thrash (2002) suggests that the overlap or shared variance among these constructs indicate that they share the same core, reflecting basic approach and avoidance motivation. A set of six studies provided support for this proposition. Exploratory and confirmatory factor analyses found that extraversion, neuroticism, positive emotionality, negative emotionality, BAS, and BIS formed two factors. More specifically, extraversion, positive emotionality, and BAS loaded onto a single factor, labeled *approach temperament*, which represents a general sensitivity to positive stimuli, such as reward and gain. Neuroticism, negative emotionality, and BIS were found to load onto a second factor, labeled *avoidance temperament,* which represents a general sensitivity to negative stimuli, such as punishment and loss. Additionally, consistent with Elliot and Church's (1997) hierarchical model of achievement motivation, these two factors were found to link to achievement goals in the manner predicted by the theory. Specifically, approach temperament was positively related with mastery goals and performance-approach goals, but unrelated to performance-avoidance goals; avoidance temperament was positively related to performance-approach goals and performance-avoidance goals, but unrelated to mastery goals.

The role of approach temperaments. The research reviewed above provides strong evidence of individual differences in approach and avoidance orientations or tendencies. The model proposes that these tendencies can also influence how individuals prioritize among competing goals. Given the association between approach temperaments and sensitivity to positive stimuli and gains, it is expected that an approach temperament will result in greater focus on goals that lead to approach-framed superordinate goals. However, the consequences of sensitivity to approach-framed goals are likely to depend

upon the particular configuration of the superordinate goals. When both goals represent approach-oriented pursuits, the proposed tendency to focus on the task with the smallest discrepancy is expected to be accentuated. In contrast, when one goal serves an approach oriented superordinate goal while the other serves an avoidance-oriented superordinate goal, a high approach temperament is expected to decrease the tendency for the avoidance-oriented goal to receive priority.

Hypothesis 7: Individual differences in approach temperament, the framing of superordinate goals, and discrepancies will interact in their influence on the prioritization of competing goals.

The role of avoidance temperaments. Given the association between avoidance temperaments and sensitivity to negative stimuli and losses, it is expected that an avoidance temperament will result in greater focus on goals that lead to avoidance-framed superordinate goals. The consequences of sensitivity to avoidance-framed goals for the prioritization of competing goals are also likely to depend upon the particular configuration of the superordinate goals. When both goals represent avoidance-oriented pursuits, the proposed tendency to focus on the task with the largest discrepancy is expected to be accentuated. In contrast, when one goal serves an approach oriented superordinate goal while the other serves an avoidance-oriented superordinate goal, a high avoidance temperament is expected to increase the tendency for the avoidance-oriented goal to receive priority.

Hypothesis 8: Individual differences in avoidance temperament, the framing of superordinate goals, and discrepancies will interact in their influence on the prioritization of competing goals.

Model Summary

The model proposed in this study provides an account of the processes by which individuals focus their attention and actions on one task or another in a dual-goal multitasking context. The model is dynamic in nature, predicting the focus of attention over time as a function of changes in progress towards one's goals. By incorporating changes in goal-performance discrepancies as a key factor influencing changes in the focus of action over time, the history of the system is taken into account in predicting the focus at a given point in the course of the dual-goal pursuit.

Existing research has offered contradictory accounts of how such a process may unfold (e.g., Kernan & Lord, 1990; Klien, 1989; Powers, 1973; Vancouver, 1997). The current model argues that goal-performance discrepancies play an important role, but the relationship between discrepancies and prioritization is more complex than has previously been considered. It proposes that nature of the relationship between discrepancies and prioritization is influenced by the superordinate goals that are to be achieved via the competing subordinate goals. Of particular interest in the current study is the influence of superordinate goal framing in terms of approach (i.e. gain) vs. avoidance (i.e. loss). Additionally, individual differences in approach and avoidance temperaments are proposed to play an important role as well. The empirical study described below above provides a means of testing this dynamic model of dual-goal self-regulation.

METHOD

Participants

Participants were 252 undergraduate students at Michigan State University who volunteered to participate in return for course credit. The average age of the participants was 20.00. Seventy percent of the participants were female and 83% were white.

Task Description

This study employed a computer-administered dual-task paradigm that manipulated key variables and examines their impact on the allocation of resources to the two tasks over time. Participants performed a computerized class-scheduling task adapted from Earley and Kanfer (1985), Wright (1991, 1992), and Steele-Johnson, Beauregard, Hoover, and Schmidt (2000), who utilized the task to examine motivational issues involved in *single-task* performance. In the current study, the task was adapted to allow the examination of issues involved in *dual-task* performance. This adaptation was achieved by having participants create class-schedules for fictitious students from *two different* colleges at a fictitious university. To avoid the potentially biasing influence of prior attitudes concerning the relative importance of various colleges typically represented within real universities, the two colleges in this task were simply referred to *ABC College* and *XYZ College*. Thus, one task consisted of creating schedules for students in *ABC College* at the fictional university. The second task consisted of creating schedules for students in *XYZ College* at the same university.

The schedules for each task were required to conform to the following rules:

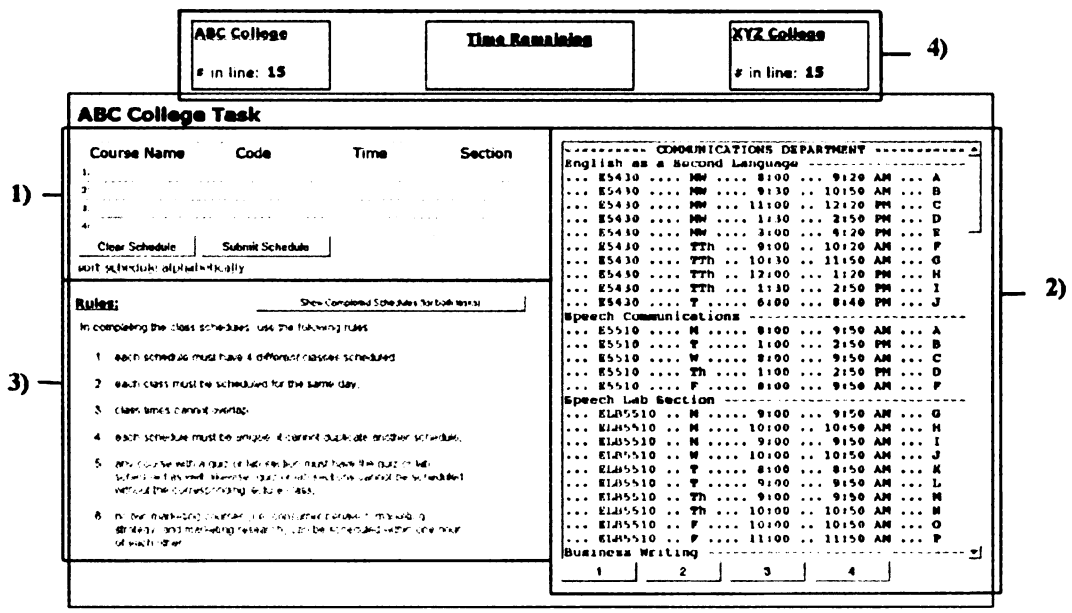
1. each schedule must have 4 different classes;
2. each class must be scheduled for the same day – for classes that meet on multiple days of the week, at least one day must be common to all classes;
3. class times cannot overlap;
4. each schedule must be unique; it cannot duplicate another schedule;
5. any course with a quiz or lab section must have the quiz or lab scheduled as well; likewise, quiz or lab sections cannot be scheduled without the corresponding lecture class;
6. no two marketing courses can be scheduled within one hour of each other.

Figure 4 presents a picture of the computer interface for the class-scheduling task. A separate but functionally equivalent interface was presented for each instance of the scheduling task. For each task, the interface included 1) a list of the classes in the current schedule near the top-left portion of the screen; 2) a list of available classes on the right half of the screen; 3) a list of the task rules on the bottom-left portion of the screen; and 4) information regarding the number of students in line and the time remaining in the simulation.

To create a schedule, participants scrolled through the list of available classes, clicked on the line listing the class they wished to add, then clicked one of four buttons at the bottom of the list of available classes – clicking one of these buttons added the class to the corresponding space in the schedule. If a class had already been added to that space in the schedule, the newly selected class replaced the existing class. Once participants were ready to submit a schedule, they clicked a button labeled "submit

schedule." Upon clicking the "submit schedule" button, the computer determined if the schedule conformed to the rules listed above. If the schedule violated one or more rules, a message was presented informing the participant of the rule or rules that had been violated – the schedule was not submitted and remained on the screen. If the schedule satisfied all rules, then it was submitted and a new blank schedule appeared.

Figure 4. Picture of the class-scheduling interface, with ABC College Task active. Boxed areas highlight: 1) the listing of courses in the current schedule; 2) the list of available courses; 3) the rules to which the schedules must conform; and 4) the time remaining in the simulation and feedback/task-selection boxes.



Participants were only able to access the interface for one task at a time. Thus, when the "*ABC College*" interface was active, participants could only create schedules for *ABC College* students – the interface for creating schedules for *XYZ College* students was not visible. Conversely, when the "*XYZ College*" interface was active, participants were only able to create schedules for *XYZ College* students, and the interface for creating schedules for *ABC College* students was not visible. This allowed for a clear

determination of which task was being performed at any point during the study. Participants could select which of the two interfaces they wished to view by clicking on the corresponding feedback box near the top of the computer screen. These boxes were visible throughout the study, allowing participants to move freely from one task to the other at any point throughout the study.

For each task, there was a separate "line" of students for whom schedules needed to be created. For example, the simulation began with a line of 5 *ABC College* students who needed to have their schedules created, as well as a separate line of 5 *XYZ College* students who needed to have their schedules created. Students were removed from the line when their schedules had been *successfully* completed (i.e. conformed to the rules described above). Participants could also create more schedules even when no students were in line – when they did so, the "number of students in line" was reported as a negative value. Participants were told that these negative values represented a "surplus" of schedules, which were then immediately available for any students who entered the lines.

For both the *ABC College* and *XYZ College* tasks, participants were provided with specific goals of 1) having no students remaining in the *ABC College* line at the conclusion of the simulation, and 2) having no students in the *XYZ College* line at the conclusion of the simulation. Additionally, new students appeared periodically in the schedule lines, increasing the number of schedules that must be completed to meet the goal. In control theory terminology, this represents "environmental disturbances" that influence the current status on the two tasks independently of the user's actions. Based upon pilot testing, the timing and number of disturbances was set such that most

participants would have difficulty meeting and maintaining the goals for both tasks, thus making the conflict among the goals more salient. Across the entire 30-minute scenario, a total of 19 additional students were added to each line. Table 1 displays the timing and number of students added to the lines throughout the session. To ensure that participants noticed when new students entered the lines, the border surrounding the task interface flashed for 4 seconds, alternating between its normal color of white and either tan or light grey, depending upon whether the students were entering the *ABC College* line or the *XYZ College* line, respectively. This was done to increase of the salience of the disturbances, thus placing the onus on how individuals chose to respond to disturbances, rather than confounding their *recognition* of the disturbances with their *reactions* to any disturbances that *were* recognized.

Throughout the simulation, feedback on both goals was visible at the top of the computer screen. Thus, regardless of which task is currently being engaged, feedback from both tasks was clearly visible. This feedback indicated the number of students in each line, as well as the time remaining in the simulation.

Table 1. Timing of environmental disturbances

Task	Time Into Scenario	Number of Students
XYZ College	1:00	2
XYZ College	1:30	1
ABC College	2:50	1
ABC College	4:00	3
XYZ College	5:30	1
XYZ College	7:30	1
ABC College	8:30	1
ABC College	9:00	2
XYZ College	10:30	1
XYZ College	11:00	3
ABC College	13:30	2
XYZ College	14:00	1
ABC College	15:00	2
XYZ College	16:00	3
ABC College	18:00	2
ABC College	18:30	1
XYZ College	21:00	1
ABC College	22:00	2
XYZ College	22:30	2
XYZ College	24:00	2
ABC College	25:00	2
ABC College	26:35	1
XYZ College	27:03	1

Procedures

The study was conducted in sessions that ranged in size from 2 to 14 participants each, with all participants in a given session assigned the same condition. Upon arriving

for the experiment, participants completed the informed consent document (Appendix A). All participants then completed the pre-session questionnaires, which consisted of cognitive ability, introversion, extroversion, behavioral inhibition system (BIS), behavioral activation system (BAS), positive affectivity, and negative affectivity (see Appendix B). Upon completion of the pre-session questionnaires, participants were introduced to the class-scheduling task, including instructions on the operation of the computer interface for creating schedules (see Appendix C). Participants were also informed of the rules to which the schedules must conform. Following this introduction, they performed the first of two practice sessions: a four-minute single-task practice trial, in which schedules were created for a single undifferentiated group of students, with no switching between multiple tasks. This practice trial represented single-task performance and was intended to orient participants with the basic operation of the class-scheduling task. Pilot testing indicated that much of the learning on the task occurred during the first four-minutes of hands-on practice with the task, resulting in relatively stable performance afterwards. Because learning was not of substantive interest in the current study, it was desirable for participants to be through the most substantial portions of the learning curve before beginning the main task, thus reducing an unwanted source of variance.[2]

Following the practice trial, participants were informed that they were responsible for creating schedules for two separate groups of students – those from *ABC College*, and those from *XYZ College* (see Appendix D). They were informed about the two separate lines of students that were awaiting the creation of their schedules. They were told that

[2] Although much of the learning occurred prior to beginning the primary engaging in the main task, it is difficult to completely remove learning effects in tasks of this nature. Indeed, a significant effect of time was observed on the total number of schedules created ($F_{(2,247)} = 51.67$), indicating that a modest amount of learning did occur during the main task. On average, participants created 2.7 more schedules during the final wave 6 minutes of the simulation, as compared to the initial 6 minutes of the simulation.

they have two separate goals in this study: 1) to reduce the length of the *ABC College* line to 0 students by the end of the simulation; and 2) to reduce the length of the *XYZ College* line to 0 students by the end of the simulation. They were informed that they reduce the number of students in each line by successfully completing the respective schedules. They were also informed that new students would periodically enter the lines. Participants were informed that completing schedules for *ABC College* students would reduce the length of the *ABC College* line, but would have no direct effect on the length of *XYZ College* line, and vice versa. They then completed the second of two practice sessions: a 3-minute dual-task practice session, which gave them an opportunity to have experience with the task-switching interface before beginning the primary trial. Pilot testing indicated that 3-minutes of dual-task practice was sufficient for participants to understand how to operate the dual-task interface.

Participants were then exposed to the experimental manipulations, which are described below. They then performed both the *ABC College* and *XYZ College* tasks simultaneously for a total of 30 minutes. Thus, the two tasks were competing in that a fixed amount of time was available for performing both tasks. Greater time spent on one task should result in greater performance on that task – however, this leaves less time available for performance of the other task, resulting in decreased performance on that task. Thus, conflict in this context comes from the inability to simultaneously execute the actions necessary for performing the two tasks, combined with the limited time in which to perform the tasks.

The 30-minute simulation was divided into six-minute segments, resulting in five waves of data. More specifically, the simulation was "paused" every six minutes, during

which time participants completed a short set of questionnaires, including measures of perceived discrepancies, and self-efficacy for both tasks (see Appendix E). Performance feedback and the time remaining in the simulation were visible to participants during this time, but the schedule-creation interfaces were inoperable, being temporarily replaced with the questionnaires. Upon completing the process questionnaires, the simulation resumed from where participants left off. After completing the simulation, participants received the debriefing (Appendix A), and were then free to go.

Experimental Design and Manipulations

Description of conditions. This study utilized a one-factor design with six-levels, manipulating the superordinate goals associated with the two tasks. The superordinate goals represent awards that could be achieved via attainment of the assigned goals for the *ABC College* and/or *XYZ College* scheduling tasks. For each of the two tasks, participants were presented either with an approach-framed superordinate goal, an avoidance-framed superordinate goal, or no superordinate goal. For the approach framing, participants were either told that a) they would *gain* a $10 gift certificate to the movie theater of their choice, or b) they would *gain* a $10 gift certificate to the fast-food restaurant of their choice if they met their assigned goal on that task. For the avoidance framing, participants were either a) given a $10 gift certificate to the movie theater of their choice, or b) given a $10 gift certificate to the fast-food restaurant of their choice at the beginning of the study and were told that they would *lose* the gift certificate if they failed to meet their assigned goal on that task. When participants were provided superordinate goals, it was randomly determined which award was associated with which

task. Additionally, some participants did not receive a superordinate goal for one or both of the scheduling tasks.

Each of the six conditions represents a unique combination of approach-framed superordinate goals, avoidance-framed superordinate goals, and/or no superordinate goal across the two tasks. Table 2 summarizes the six conditions, representing all possible combinations of superordinate goals for the two tasks. Also reported in Table 2 is the number of participants for each of the six conditions.

Table 2. Summary of conditions

	Superordinate Goals Associated with Each Task		
Condition	Task 1	Task 2	N
Control	none	none	40
Single-Approach	approach	none	39
Single-Avoid	avoid	none	52
Dual-Approach	approach	approach	40
Dual-Avoid	avoid	avoid	41
Approach-and-Avoid	avoid	approach	40

Prior to each of the six-minute waves comprising the 30-minute simulation, participants in the superordinate goal conditions were informed of the awards and the level(s) of performance that were associated with the awards. To ensure that participants understood the awards in the task, participants were quizzed about the awards immediately after this information was presented. Those who responded incorrectly were presented the information again and re-quizzed until they responded correctly. Pilot testing indicated that this level of prompting and quizzing was necessary for some participants to recognize and understand the awards associated with the task.

Determining the reference point for comparisons within and across conditions. Testing the hypotheses in this study requires comparisons between the participant actions used on the two tasks to meet the respective goals (e.g., time spent on one task versus the other, the magnitude of discrepancies on one task versus the other). To make such comparisons, it is critical to be clear about what these comparisons represent. Due to important randomization processes used in the research design, the raw behavioral data cannot be used to examine the hypotheses. Take, for example, the hypothesis that participants with a superordinate goal for only one of the two tasks will focus primarily upon the task associated with the superordinate goal. To avoid confounding the task with superordinate goals (ex. ABC College always being associated with the superordinate goal in the single-superordinate-goal conditions), which of the two tasks was associated with the superordinate goal was randomly determined for each participant. Thus, when testing this hypothesis, it is critical to know which of the two tasks was associated with the superordinate goal. As another example, for one participant in the approach-and-avoid superordinate goal condition, the approach superordinate goal could be associated with ABC College and the avoidance superordinate goal associated with XYZ College. However, for another participant in that same condition, the approach-framed superordinate goal could be associated with XYZ College and the avoidance-framed superordinate goal associated with ABC College. Again, when testing the hypotheses, it is critical to know which superordinate goal was associated with which task.

Therefore, the data were coded in a manner that 1) allows a clear determination of which task was associated with which superordinate goal (among the conditions in which superordinate goals differ across tasks) and 2) allows for meaningful interpretations to be

drawn form analyses involving all conditions. This approach essentially consists of designating one task as the "referent" task, which serves as the reference point for the comparison. The remaining task is designated the "non-referent" task. Because each task differed with respect to the specific combination of superordinate goals associated with the tasks, the specific manner in which the referent task was designated differed somewhat in each condition. Table 3 summarizes the designation of the referent in each condition, and is described in detail in the following paragraphs.

Table 3. Coding scheme utilized for data analysis.

Condition	Referent Task
Control	Randomly determined
Single-Approach	Task with superordinate goal
Single-Avoid	Task with superordinate goal
Dual-Approach	Randomly determined
Dual-Avoid	Randomly determined
Approach-and-Avoid	Task with *avoid* superordinate goal

In the single-approach and the single-avoid conditions, the task associated with the superordinate goal (which was randomly determined for each participant) serves as the *referent task*, whereas the other task serves as the *non-referent task*. In the approach-and-avoid condition, in which an approach-framed superordinate goal was associated with one task and an avoidance-framed superordinate goal was associated with the other, the task that was associated with the *avoidance*-framed superordinate goal serves as the

referent.[3] In the control, dual-approach, and dual-avoid conditions, both tasks are equivalent with respect to the superordinate goals associated with their performance, making the designation of referent arbitrary. Thus, for each participant in these three conditions, the referent task was randomly determined. As discussed above, this coding scheme is necessary for the meaningful analysis and interpretation of the data in this study. It is utilized extensively in the subsequent discussions of the study variables and data analysis.

Measures

Cognitive ability. Participants were asked to report their scores on the ACT or SAT college admissions test. This served as an indicator of cognitive ability and was used as a control variable in all analyses. Self-reported test scores have been demonstrated to correlate very highly with actual test scores (r = .94; Gully, Payne, Kiechel, & Whiteman, 1999). Additionally, the test scores are considered a valid measure of general cognitive ability (e.g., Schmidt, 1988) and are highly reliable (KR-20 = .96 for the ACT composite score; American College Testing Program, 1989). In this sample, the average level of ability was equivalent to an ACT score of 23.97.

Approach and avoidance temperaments. Approach and avoidance temperaments were measured following the approach reported by Elliot and Thrash (2002). Specifically, *extraversion* and *neuroticism* were each assessed with 10 items scales

[3] The task with the approach-framed superordinate goal could have been assigned as the referent task with no change in the interpretations. This would simply invert the direction of relationships in the analyses, but would not alter their interpretations.

For example, in this condition participants spent 59% of their time on the referent task. With the coding as it is, this means that participants spent 59% of their time on the task with the avoidance-framed superordinate goal, and 41% of their time on the approach-framed task. If the approach-framed superordinate task were assigned as the referent, the results would show that participants 41% of their time on the referent task. However, this would still translate into spent 59% of their time on the task with the avoidance-framed superordinate goal and 41% of their time on the approach-framed task.

developed as part of the International Personality Item Pool (IPIP: Goldberg, in press). *Behavioral Inhibition System (BIS)* and *Behavioral Activation System (BAS)* sensitivity were assessed via a 24 item self-report measure developed by Carver and White (1994). Additionally, *positive affectivity* and *negative affectivity* were assessed via a 20-item self-report measure (PANAS: Watson & Clark, 1993). Factor analyses conducted on the data from this study replicated the two-factor solution reported by Elliot and Thrash, with one factor representing approach-oriented constructs and the other representing avoidance-oriented constructs. Thus, following the procedures outline by Elliot and Thrash (2002), the latent approach and avoidance variables resulting from these factor analyses were utilized as representations of approach and avoidance temperaments.

Goal-performance discrepancies. Discrepancies between current status and the goals were assessed for both tasks in two ways. First, prior to each wave, participants completed a two-item self-report measure of perceived discrepancies *for each task* (see Appendix E). Participants responded to these items on a 7-point Likert scale, where a value of 1 indicated that participants felt their performance was far worse than the goal, a value of 4 indicated that participants felt their performance was equivalent with the goal, and a value of 7 indicated that participants felt their performance had exceeded the goal. The average correlation between these two items was .78. Therefore, the two items were averaged into a single measure for each task, representing how far participants felt they were from attaining the goal for that task.

The second representation of goal-performance discrepancies was the actual discrepancy for each task. Because participants were assigned a goal of "0" students in each line, and this goal was constant across time, discrepancies for each task were simply

represented as the number of students in the respective lines – however, to be consistent with the coding of perceived discrepancies and to be more easily interpretable, the number of students in line was multiplied by –1, reversing its meaning. Thus, negative values indicate that there are more students in line than is specified by the goal (i.e. "0") – that is, the goal is *not* currently being met. Discrepancy values of zero indicate that the goal is being met exactly. Finally, positive discrepancy values indicate that the number of students in the line is less than the number specified by the goal – that is, the goal is being *exceeded.* Again, separate discrepancy variables exist for each task. Because discrepancies were utilized as predictors of resource allocation, they were operationalized as the number of students in each line *at the beginning of each wave.* Thus, participants' status on the two goals at the beginning of a given wave was utilized to predict their subsequent allocation of resources during the following six minutes that comprise that wave.

Because the *perception* of one's progress towards goals is understandably given primacy in most theories of self-regulation (e.g., Carver & Scheier, 1998; Powers, 1978), the perceived discrepancy variables are the primary focus of the analyses reported below. Further, in most cases, the results for perceived and actual discrepancies are consistent, such that the reporting of both would be largely redundant. However, exceptions are noted in the relevant analyses.

Relative goal-performance discrepancies. Relative discrepancies were created by taking the difference between the two discrepancy variables. More specifically, relative discrepancies were computed as *referent task discrepancy – non-referent task discrepancy.* Thus, negative values indicate that the discrepancy for the referent task is

larger than the discrepancy for the non-referent task. A value of '0' indicates that the discrepancies for both tasks are the same. Finally, positive values indicate that the discrepancy for the referent task is smaller than the discrepancy for the non-referent task. Again, relative discrepancies were computed for both *perceived* and *actual* discrepancies but, with exceptions noted in the relevant analyses below, they produce largely redundant effects. Thus, with a few exceptions, only the results of relative *perceived* discrepancies are reported.

Self-efficacy. Self-efficacy was assessed prior to each 6-minute wave. Although self-efficacy was not the focus of the hypotheses outlined above, and existing research makes it unclear how self-efficacy may function in a dual-goal context, it may yield interesting results that can stimulate future research. Thus, it was assessed for use in exploratory analyses. The primary measure, self-efficacy magnitude (Bandura, 1986), simply asked participants to indicate the number of participants they thought would be in each of the lines at the end of the simulation. Participants responded to this measure on an eight-point scale (8 = "*Less Than 0*", 7 = "*0*", 6 = "*1 to 3*", 5 = "*4 to 6*", 4 = "*7 to 9*", 3 = "*10 to 12*", 2 = "*13 to 15*", 1 = "*16 or More*"). Thus, higher values indicate greater efficacy. Additionally, a four item Likert-based measure of self-efficacy was also assessed (see Appendix E).[4] Participants completed these items independently for *both* the *ABC College* and *XYZ College* scheduling tasks. These measures were assessed at the following points during the course of the experiment: 1) prior to beginning the dual-task

[4] The pattern of results for the between-person analyses involving these two measures of self-efficacy was essentially identical. However, there was little within-person variance on the Likert-based measure, resulting in relatively weak within-person relationships with other study variables. Because the within-person relationships are of primary interest in this study, self-efficacy magnitude was utilized in all analyses discussed below.

simulation; 2) 6 minutes into the simulation; 3) 12 minutes into the simulation; 4) 18 minutes into the simulation; and 5) 24 minutes into the simulation.

Relative Self-Efficacy. Relative self-efficacy was created by taking the difference between self-efficacy for the two tasks. More specifically, relative self-efficacy was computed as *referent task self-efficacy – non-referent task self-efficacy*. Thus, positive values indicate that self-efficacy for the referent task is higher than self-efficacy for the non-referent task. A value of '0' indicates that self-efficacy for both tasks is the same. Finally, negative values indicate that self-efficacy for the referent task is lower than self-efficacy for the non-referent task.

Resource allocation. The computer recorded which of the two tasks was being performed during each second of the simulation. When one task was being performed, the other task was obscured from view (with the exception of information concerning the current performance status, which was visible for both tasks at all times during the simulation). This structure facilitates the validity of the resource allocation variable, as it is impossible to physically create schedules for one college while the interface for the other is active. Resource allocation was then operationalized as the percentage of time participants spent focused on the referent task during each six-minute wave (e.g., time focused on referent task / 360).

RESULTS

Descriptive Statistics

Table 4 presents the overall means, standard deviations, and correlations for the major study variables. Caution is needed when interpreting the correlations. First, while there are 1234 observations contributing to these correlations, these observations are based on only 248 participants – because many of these variables were assessed multiple times during the study, they are represented five times per participant in this table. This makes the significance tests on these correlations, which assume independence, largely meaningless. More important is that the correlations confound between and within person relationships among the constructs. For instance, as highlighted by Vancouver et al., 2001, a positive relationship between self-efficacy and performance does not indicate if *individuals* with higher self-efficacy tend to have higher performance, if *within-subject* increases in individuals self-efficacy correspond to *within-subject* increases in performance (and vice-versa), some combination of the two, or some other alternative.

To help distinguish between- and within-person correlations, separate tables are provided for each. In Table 5, the values for perceived and actual discrepancies, resource allocation, switching, and self-efficacy were averaged for each participant – these person-averages were then correlated, providing the *between*-person correlations among the variables. For example, a large positive between-person correlation was found for relative discrepancies and resource allocation. Thus, *individuals* who had smaller *average* discrepancies on the referent task spent more time on the referent task *averaged* across the entire simulation. However, this between-person correlation is unable to address the questions of interest in this study, which is focused on the *within-person*

relationships. It is nearly axiomatic that individuals who spent more time on the referent task (and, therefore, less time on the non-referent task) would have smaller discrepancies on the referent task than individuals who spent less time on the referent task. The between-person correlations may be largely a reflection of this aspect of the reciprocal relationship between discrepancies and resource allocation. The within- person relationships may reflect something quite different.

In Table 6, the values were centered within person – that is, participants' average value for a given variable was subtracted from each individual assessment of that variable. This reduces the between-person covariance among the variables, leaving the within-person relationships as a larger contributor to the correlations than is the case with the raw correlations presented in Table 4. However, the correlations reflect covariance across all observations, treating each as if it is an independent observation. Thus, the person-centered correlations still fail to take the nesting of the data into consideration (i.e. that each individual contributes five related observations), leading to biased estimates of the relationships and their significance. The person-centered correlations provide a *closer* approximation of the within-person relationships than is provided by the raw correlations or the between-person correlations. However, by treating each observation as if it were independent, interpretation of these correlations is still very difficult and imprecise.

Finally, Tables 7 – 11 provide the within-person correlations at each of the five time periods. Again, by using the person-centered data, these tables provide a rough approximation of within-person relationships at each time period. However, because there is only one observation for each individual per time period, the correlations in can

only reflect *between-person* covariance – only, in this case, it is between-person covariance among person-centered variables. Thus, although these tables, like the preceding correlation matrices, provide some descriptive information about the variables and their covariance, interpreting these values is very difficult. Thus, readers are cautioned against drawing firm conclusions from these tables. The relationships of interest among these variables will be examined more systematically with appropriate analytic techniques when the hypothesis tests are described in subsequent sections of the results. These analyses allow one to focus precisely upon the within-person relationships of interest in this study, in addition to examining between-person relationships when appropriate.

Table 4. Overall means, standard deviations, and intercorrelations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Ability	.63	.76	1.00													
2. Approach Temperament	.01	.76	.09	1.00												
3. Avoidance Temperament	.02	.91	-.12	-.41	1.00											
4. Referent Discrepancy (actual)	-3.33	5.00	.16	.02	-.05	1.00										
5. Non-Referent Discrepancy (actual)	-5.63	5.22	.14	.01	-.05	.38	1.00									
6. Relative Discrepancy (actual)	2.30	7.73	.00	.01	.00	.48	-.63	1.00								
7. Referent Discrepancy (perceived)	-.91	1.44	.07	-.07	-.08	.33	-.08	.35	1.00							
8. Non-Referent Discrepancy (perceived)	-1.21	1.40	-.02	-.04	-.14	.01	.31	-.29	.35	1.00						
9. Relative Discrepancy (perceived)	.30	1.63	.08	-.03	.04	.28	-.34	.56	.59	-.56	1.00					
10. Self-Efficacy Referent	5.20	1.86	.17	.05	-.05	.58	.01	.48	.20	-.12	.29	1.00				
11. Self-Efficacy Non-Referent	4.40	2.06	.16	.04	-.04	.06	.60	-.51	-.16	.16	-.28	.23	1.00			
12. Relative Self-Efficacy	.80	2.44	.00	.00	-.01	.39	-.49	.80	.29	-.23	.45	.57	-.67	1.00		
13. Focus Shifts	1.97	1.78	.02	.06	-.05	.02	.12	-.10	.00	.05	-.04	.07	.23	-.14	1.00	
14. Resource Allocation	.58	.31	-.04	.04	-.04	.13	-.17	.26	.02	-.02	.03	.26	-.30	.45	-.20	1.00

Note. N = 1234; Correlations larger than .05 are significant at $p < .05$

Table 5. Between-person means, standard deviations, and intercorrelations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Ability	.63	.76	1.00													
2. Approach Temperament	.01	.76	.10	1.00												
3. Avoidance Temperament	.02	.91	-.12	-.41	1.00											
4. Referent Discrepancy (actual)	-3.33	3.86	.27	.04	-.09	1.00										
5. Non-Referent Discrepancy (actual)	-5.61	3.87	.27	.02	-.09	-.13	1.00									
6. Relative Discrepancy (actual)	2.29	5.81	.00	.01	.00	.75	-.75	1.00								
7. Referent Discrepancy (perceived)	-.91	1.09	.10	-.08	-.11	.44	-.04	.32	1.00							
8. Non-Referent Discrepancy (perceived)	-1.20	1.05	-.02	-.05	-.18	-.02	.33	-.23	.48	1.00						
9. Relative Discrepancy (perceived)	.30	1.10	.12	-.03	.06	.45	-.36	.54	.54	-.49	1.00					
10. Self-Efficacy Referent	5.20	1.59	.20	.06	-.06	.75	-.13	.58	.18	-.21	.38	1.00				
11. Self-Efficacy Non-Referent	4.40	1.70	.19	.05	-.05	-.11	.74	-.57	-.22	.08	-.30	.20	1.00			
12. Relative Self-Efficacy	.80	2.09	.00	.00	-.01	.66	-.70	.91	.32	-.23	.54	.60	-.66	1.00		
13. Focus Shifts	9.81	6.33	.03	.08	-.07	.05	.40	-.23	-.05	.03	-.08	.11	.36	-.21	1.00	
14. Resource Allocation	.59	.32	.00	.09	-.04	.57	-.61	.78	.21	-.22	.42	.49	-.44	.73	-.11	1.00

Note. N = 248; Correlations larger than .12 are significant at $p < .05$

Table 6. Within-person means, standard deviations, and intercorrelations

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	.00	3.18	1.00										
2. Non-Referent Discrepancy (actual)	.00	3.49	.62	1.00									
3. Relative Discrepancy (actual)	.00	5.10	.28	-.59	1.00								
4. Referent Discrepancy (perceived)	.00	.97	.17	-.05	.23	1.00							
5. Non-Referent Discrepancy (perceived)	.00	.91	.11	.26	-.20	.18	1.00						
6. Relative Discrepancy (perceived)	.00	1.20	.17	-.34	.58	.37	-.37	1.00					
7. Self-Efficacy Referent	.00	.97	.48	.16	.30	.19	.08	.17	1.00				
8. Self-Efficacy Non-Referent	.00	1.16	.26	.57	-.43	.04	.20	-.27	.31	1.00			
9. Relative Self-Efficacy	.00	1.26	.13	-.40	.62	.11	-.12	.38	.48	-.68	1.00		
10. Focus Shifts	.00	1.25	-.01	-.06	.06	.08	.04	.00	.00	.04	-.03	1.00	
11. Resource Allocation	.00	.22	-.19	.14	-.37	-.14	.06	-.29	-.07	.02	-.07	-.14	1.00

Note. N = 1234; Correlations larger than .05 are significant at $p < .05$

Table 7. Within-person means, standard deviations, and intercorrelations *at time 1*

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	8.33	3.86	1.00										
2. Non-Referent Discrepancy (actual)	10.61	3.87	-.13	1.00									
3. Relative Discrepancy (actual)	-2.29	5.81	.75	-.75	1.00								
4. Referent Discrepancy (perceived)	-.13	1.21	.36	.12	.16	1.00							
5. Non-Referent Discrepancy (perceived)	.24	1.25	-.01	.29	-.20	.33	1.00						
6. Relative Discrepancy (perceived)	-.29	1.44	.47	-.44	.61	.23	-.36	1.00					
7. Self-Efficacy Referent	.38	1.25	.64	-.07	.48	.20	-.02	.27	1.00				
8. Self-Efficacy Non-Referent	.81	1.38	-.03	.61	-.43	.12	.17	-.35	.29	1.00			
9. Relative Self-Efficacy	-.43	1.58	.54	-.59	.75	.05	-.17	.52	.54	-.65	1.00		
10. Focus Shifts	-.25	1.18	.08	.15	-.05	.03	.12	-.05	.03	.12	-.08	1.00	
11. Resource Allocation	.01	.21	-.29	.22	-.34	-.09	.11	-.23	-.13	.03	-.13	-.09	1.00

Note. N = 248; Correlations larger than .11 are significant at $p < .05$

Table 8. Within-person means, standard deviations, and intercorrelations *at time 2*

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	-2.43	2.50	1.00										
2. Non-Referent Discrepancy (actual)	-1.18	2.43	-.15	1.00									
3. Relative Discrepancy (actual)	-1.25	3.78	.77	-.75	1.00								
4. Referent Discrepancy (perceived)	-.11	.82	.34	.10	.16	1.00							
5. Non-Referent Discrepancy (perceived)	.08	.72	.05	.14	-.06	.24	1.00						
6. Relative Discrepancy (perceived)	-.08	.97	.39	-.38	.50	.39	-.26	1.00					
7. Self-Efficacy Referent	.09	.77	.44	.01	.29	.28	.19	.13	1.00				
8. Self-Efficacy Non-Referent	.26	.87	.02	.39	-.24	.10	.06	-.08	.20	1.00			
9. Relative Self-Efficacy	-.17	1.04	.31	-.32	.42	.13	.10	.16	.58	-.69	1.00		
10. Focus Shifts	-.14	1.17	.10	.09	.00	.02	-.02	-.11	.09	.16	-.07	1.00	
11. Resource Allocation	-.01	.22	-.33	.27	-.40	-.03	-.03	-.22	-.06	-.01	-.04	-.09	1.00

Note. N = 248; Correlations larger than .11 are significant at $p < .05$

Table 9. Within-person means, standard deviations, and intercorrelations *at time 3*

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	-2.63	1.75	1.00										
2. Non-Referent Discrepancy (actual)	-2.30	1.63	-.69	1.00									
3. Relative Discrepancy (actual)	-.33	3.13	.93	-.91	1.00								
4. Referent Discrepancy (perceived)	.04	.70	.21	-.11	.18	1.00							
5. Non-Referent Discrepancy (perceived)	-.11	.73	-.13	.18	-.17	-.06	1.00						
6. Relative Discrepancy (perceived)	-.11	1.04	.49	-.47	.52	.43	-.46	1.00					
7. Self-Efficacy Referent	-.07	.72	.31	-.11	.23	.12	.00	.12	1.00				
8. Self-Efficacy Non-Referent	-.01	.82	-.05	.19	-.13	.07	-.01	-.08	.33	1.00			
9. Relative Self-Efficacy	-.06	.89	.29	-.26	.30	.04	.01	.16	.50	-.65	1.00		
10. Focus Shifts	-.21	1.10	.02	-.03	.03	-.03	-.06	-.02	.01	.05	-.04	1.00	
11. Resource Allocation	.02	.21	-.63	.59	-.66	-.17	.09	-.39	-.08	.05	-.11	-.07	1.00

Note. N = 247; Correlations larger than .12 are significant at $p < .05$

Table 10. Within-person means, standard deviations, and intercorrelations *at time 4*

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	-1.99	2.42	1.00										
2. Non-Referent Discrepancy (actual)	-3.32	2.33	-.24	1.00									
3. Relative Discrepancy (actual)	1.33	3.74	.80	-.78	1.00								
4. Referent Discrepancy (perceived)	-.13	.87	.30	-.03	.21	1.00							
5. Non-Referent Discrepancy (perceived)	-.16	.75	.02	.34	-.20	.11	1.00						
6. Relative Discrepancy (perceived)	.15	1.07	.41	-.43	.53	.44	-.32	1.00					
7. Self-Efficacy Referent	-.18	.72	.57	-.12	.44	.09	.12	.17	1.00				
8. Self-Efficacy Non-Referent	-.44	.86	-.01	.46	-.29	.06	.22	-.15	.15	1.00			
9. Relative Self-Efficacy	.26	1.04	.41	-.46	.55	.02	-.09	.24	.57	-.72	1.00		
10. Focus Shifts	.13	1.13	-.01	.05	-.04	.11	.01	.00	-.02	.02	-.03	1.00	
11. Resource Allocation	-.02	.21	-.25	.33	-.37	-.18	.09	-.33	-.06	.08	-.10	-.14	1.00

Note. N = 246; Correlations larger than .12 are significant at $p < .05$

Table 11. Within-person means, standard deviations, and intercorrelations *at time 5*

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Referent Discrepancy (actual)	-1.32	4.44	1.00										
2. Non-Referent Discrepancy (actual)	-3.89	4.37	-.12	1.00									
3. Relative Discrepancy (actual)	2.57	6.60	.75	-.75	1.00								
4. Referent Discrepancy (perceived)	.33	1.07	.44	.04	.27	1.00							
5. Non-Referent Discrepancy (perceived)	-.05	.93	.07	.37	-.20	.15	1.00						
6. Relative Discrepancy (perceived)	.34	1.33	.41	-.49	.60	.42	-.38	1.00					
7. Self-Efficacy Referent	-.23	1.11	.62	.00	.42	.35	.07	.28	1.00				
8. Self-Efficacy Non-Referent	-.63	1.16	.04	.62	-.38	.11	.27	-.24	.20	1.00			
9. Relative Self-Efficacy	.40	1.44	.45	-.50	.63	.18	-.17	.41	.61	-.65	1.00		
10. Focus Shifts	.47	1.48	.17	.15	.02	.09	.14	-.02	.08	.27	-.15	1.00	
11. Resource Allocation	-.01	.24	-.36	.14	-.34	-.24	.03	-.30	-.07	-.08	.01	-.23	1.00

Note. N = 245; Correlations larger than .12 are significant at $p < .05$

Table 12 displays the percentage of time that participants spent focused on the referent task, by condition. Participants in three of the conditions – control, dual-approach, and dual-avoid – spent a more-or-less equal percentage of time on both tasks. In contrast, participants in the single-approach and the single-avoid conditions spent considerably more time focused on the referent task – that is, they spent much of their time focused on the task with which the superordinate goal was associated. Additionally, participants in the approach-and-avoid condition spent 59% of their time on the avoidance task, compared to 41% on the approach task. This pattern of results will be discussed in greater depth when the hypothesis tests are discussed below. Table 12 also displays the average number of times that participants switched from one task to the other, by condition. As expected, participants in the single-approach and the single-avoid conditions switched tasks the least, changing tasks approximately eight times across the 30-minute simulation. Those in the control condition demonstrated the highest levels of switching, switching approximately 12 times during the simulation. Finally, those in the remaining three conditions had intermediate levels of switching.

Table 12. Percentage of time allocated to referent-task and task-switching by condition

	% on Referent		Switching	
Condition	M	SD	M	SD
control	.49	.06	11.92	4.28
single-approach	.72	.19	7.88	5.77
single-avoid	.69	.20	8.46	5.54
dual-approach	.47	.24	10.82	7.06
dual-avoid	.50	.20	9.97	5.58
approach-and-avoid	.59	.25	10.62	8.48

Table 13 displays the percentage of participants attaining the goals at the end of the study – that is, this table indicates the percentage of participants in each condition who ended the study with 0 or fewer students in the respective lines. Participants in three conditions – control, dual-approach, and dual-avoid – met the goals for the referent task with roughly the same frequency as they met the non-referent task. This is not surprising, as the two tasks in these conditions were equivalent with respect to the superordinate goals (or lack thereof) associated with their attainment. However, it is notable that participants in the control condition met the two goals with less frequency than those in the two other conditions in which the superordinate goals were the same across the two tasks. Participants in the single-approach and single-avoid conditions met the referent task goal with greater frequency than the remaining conditions, while meeting the non-referent task with the lowest frequency. This pattern is not unusual, as the existence of a superordinate goal for only one tasks was expected to lead to almost exclusive focus on that task. Finally, it is also worth nothing that participants in the approach-and-avoid condition met the referent task goal with relatively high frequency, but met the non-referent task relatively infrequently.

Table 13 also provides information concerning the percentage of participants attaining the goals for *both* tasks, by condition. The task was designed such that it would be difficult for most participants to meet both goals, thus creating conflict among the goals. Overall, the percentage of participants meeting both goals was low (14%), suggesting that the task possessed the desired level of difficulty and, as a result, goal conflict. The overall difficulty-level of this task (as judged by the percentage of participants meeting the goals for *both* tasks) is consistent with the standard

operationalization of difficulty in the goal-setting literature, in which difficult goals are set at the 85th percentile, such that only the top 15% of performers can meet the goals (Locke & Latham, 1990a).

Table 13. Percentage of participants meeting the goal for a) the referent task, b) the non-referent task, and c) both tasks at *end* of study

Condition	% Meeting Referent-Task Goal	% Meeting Non-Referent-Task Goal	% Meeting Both Task Goals
control	0.13	0.15	0.13
single-appraoch	0.62	0.13	0.13
single-avoid	0.64	0.08	0.06
dual-approach	0.42	0.45	0.26
dual-avoid	0.44	0.31	0.15
approach-and-avoid	0.50	0.28	0.15
Total	*0.47*	*0.22*	*0.14*

Analysis Overview

The data in this study were tested with Hierarchical Linear Modeling (HLM: Bryk & Raudenbush, 1992), implemented via the mixed procedure in SAS (see Singer, 1998 for details).[5] HLM was developed to examine data that is nested within higher-level units, such as individuals nested within teams or, in the present case, multiple observations over time nested within individuals. A core assumption of more traditional analyses, such as regression, is that each observation is independent. When this assumption is violated, as is the case in the present study given the repeated observations of IVs and DVs, the more

[5] The *software program* "Hierarchical Linear Modeling" that is commonly used for implementing the HLM analysis *technique* assumes that the residuals are independent, which may not be a valid assumption given the nature of the data in this study. By using the SAS mixed procedure to conduct the HLM analyses, I was able to utilize an unstructured error covariance matrix in all analyses, which requires minimal assumptions concerning the data. Alternative covariance structures (ex. autoregressive) were examined as well, with no substantive change in the conclusions resulting from these analyses.

traditional analyses will frequently provide upwardly biased tests of the model parameters, resulting in often substantial increases in Type I errors. HLM takes the lack of independence inherent in nested data structures into consideration, resulting in more appropriate tests of the model parameters.

HLM allows for examination of predictors at both the person- and wave-levels of analysis. In this study, resource allocation and discrepancies were examined as level-1 (wave-level) variables. These variables were assessed on multiple occasions and could vary over the course of the study. Additionally, level-2 (person-level) predictors can be utilized to explain variance in level-1 means/intercepts (i.e. main effects), as well as variance in the relationship between a level-1 outcome and a level-1 predictor (i.e. interaction). Condition, ability, approach temperament, and avoidance temperament were examined as level-2 predictors, as these variables were assessed only once per participant and did not vary over the course of the study. Table 14 below summarizes level of analysis for each of the study variables listed above, where each variable is categorized as level one (within subjects) or level 2 (between subjects).

Because the hypotheses in this study are concerned only with within-person variance, the level-1 predictors were group-centered (i.e. centered within individuals) throughout. The choice concerning whether or not to group-center is critical to the interpretations that can be drawn from the model and must match the theory being tested. When predictors are *not* centered within groups, they can account for both *between* and *within*-group variance in the outcome (e.g., Bryk & Raudenbush, 1992; Hofmann & Gavin, 1998; Kreft, de Leew, & Aiken, 1995). More importantly, these two sources of variance are confounded when predictors are *not* group-centered. For example, without

group centering, finding that self-efficacy is positively related to performance does not allow one to determine if *individuals* with higher self-efficacy tend to have higher performance, if *within-subject* increases in individuals self-efficacy correspond to *within-subject* increases in performance (and vice-versa), some combination of the two, or some other alternative. By group-centering the predictors – subtracting the value of a predictor at *each observation* from the individuals average for that predictor *across time* – it is possible to isolate the focus to the within-subjects relationships. Again, because the process of interest in this study occurs within individuals over time, group-centering level-1 predictors is an important step in the appropriate interpretation of the results.

Table 14. Level of analysis for study variables

Variable	Level
Condition	Level-2
Cognitive Ability (covariate)	Level-2
Approach Temperament	Level-2
Avoidance Temperament	Level-2
Wave (i.e. time)	Level-1
Referent Task Discrepancies	Level-1
Non-Referent Task Discrepancies	Level-1
Relative Discrepancies	Level-1
Resource Allocation	Level-1
Referent Task Self-Efficacy (exploratory)	Level-1
Non-Referent Task Self-Efficacy (exploratory)	Level-1
Relative Self-Efficacy (exploratory)	Level-1

Hypothesis Tests

Relative Discrepancies and Condition Effects on Resource Allocation

Hypothesis 1. Hypothesis 1 is a general hypothesis proposing that resource allocation will vary as a function of relative discrepancies, condition, and their interaction. The test of this hypothesis will be discussed in two stages. First, the tests of

the main effects of condition and relative discrepancies will be discussed and, second, the interaction among condition and relative discrepancies will be examined.

To test the main effect of condition and relative discrepancies on resource allocation, a two-level HLM was conducted with resource allocation as the level-1 dependent variable, relative discrepancies as the level-1 predictor, and condition as a level-2 predictor. Additionally, ability was included as a level-2 covariate. The results of this analysis are summarized in Table 15, including γ for the continuous predictors (analogous to the average within-person regression weight across participants), numerator and denominator degrees of freedom, the value of the *F*-test associated with each predictor, and the *p*-value associated with each *F*-test.

Table 15. Main effects of relative discrepancies and condition on percentage of time allocated to the referent task.

	γ	Num DF	Den DF	*F*-value	*p*-value
Ability	-0.01	1	241	0.63	.429
Relative Discrepancies	-0.06	1	241	115.13	< .001
Condition	n/a (see Table 12)	5	241	12.71	< .001

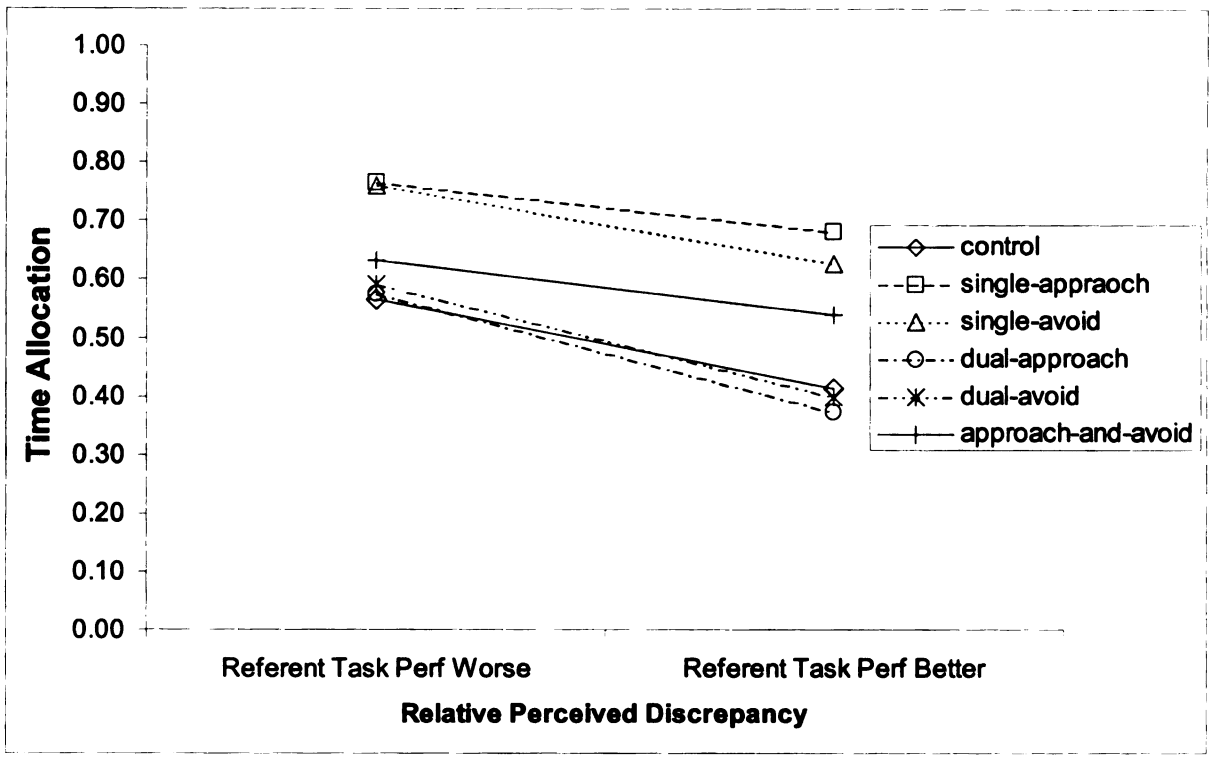
Ability did not account for significant variance in resource allocation (γ = -0.01, $F_{(1, 241)}$ = -0.63, p = .429). Relative discrepancies were a significant predictor of resource allocation (γ = 0.06, $F_{(1, 241)}$ = 115.13, p < .001). The nature of this relationship was such that the perception of larger discrepancies on the referent task (in comparison to the non-referent task) were associated with increased time subsequently allocated to the referent task and, by extension, decreased time allocated to the non-referent task. In contrast,

larger discrepancies on the *non*-referent task were associated with decreased time subsequently allocated to the referent task and increased time allocated to the non-referent task. Simply put, additional time was devoted to whichever task was furthest from its goal, which necessarily resulted in less time being devoted to the other task.

Condition also had a significant main effect on resource allocation ($F_{(5, 241)} = 12.71, p < .001$). The percentage of resources allocated to the referent task in each condition was displayed previously in Table 12. Participants in three of the conditions – the control condition, the dual-approach condition, and the dual-avoid condition – allocated time more-or-less equally across the two tasks. This is not surprising, as the two tasks in these conditions were equivalent with respect to the superordinate goals (or lack thereof) associated with their performance. Thus, approximately 50% of their time was spent on each task. Also not surprising is the finding that, as expected, participants in the two single-superordinate-goal conditions devoted significantly greater time to the referent task (i.e. the task associated with the superordinate goal). More specifically, participants in the single-approach condition spent 72% of their time focused on the task associated with the superordinate goal, whereas participants in the single-avoid condition spent 70% of their time on the superordinate-goal-task. More interesting is the finding that participants in the approach-and-avoid condition spent significantly more time focused on the referent task, which in this condition represents the task associated with the avoidance-framed superordinate goal. Participants in this condition spent 59% of their time focused on the avoidance task, which translates into 58 more seconds per six-minute wave spent on the avoidance task than was spent on the approach task, or nearly 5 additional minutes on the avoidance task across the entire 30-minute scenario.

The next step in examining Hypothesis 1 was to add the interaction term between relative discrepancies and condition. As predicted, relative discrepancies and condition interacted in their relationships with resource allocation ($F_{(5, 241)} = 2.43, p < .05$). That is, the relationship between relative discrepancies and resource allocation varied significantly across conditions. The nature of this interaction is displayed in Figure 5. For all conditions, the direction of the relationship between relative discrepancies and resource allocation was the same, such that additional time was allocated to the task that was furthest from its goal. However, the strength of this relationship differed across conditions. The relationship between relative discrepancies and resource allocation was strongest in the dual-approach and dual-avoidance conditions. Not surprisingly, a relatively weak relationship was observed for the two single-superordinate-goal conditions – because a superordinate goal existed for only one task, attention was devoted primarily to that task and the relative discrepancies were less of a factor for these participants. The relationship between relative discrepancies and resource allocation was weakest in the approach-and-avoid condition, although this difference did not conventional levels of statistical significance. The presence of an interaction between condition and relative discrepancies provides support for Hypothesis 1.

Figure 5. Interaction of relative discrepancies and condition on percentage of time allocated to referent task.



Hypothesis 2. Hypothesis 2 proposed that, in the conditions with a single superordinate goal, the task associated with the superordinate goal would receive greater priority. Examination of the main-effect of condition presented in Table 12 above demonstrates that, as hypothesized, participants in these two conditions spend significantly more time focused on the task associated with the superordinate goal. These two conditions did not significantly differ from each other with respect to the percentage of time devoted to the task with the superordinate goal ($F_{(1, 241)} = 0.45, p = .504$) – participants in the single-approach condition spent 72% of their time focused on the task associated with the superordinate goal, whereas participants in the single-avoid condition

spent 70% of their time on the task associated with the superordinate goal. Additionally, participants in these two conditions exhibited significantly less switching from one task to the other than did participants in the remaining conditions ($F_{(1, 242)} = 15.67, p < .001$), but again did not differ significantly from each other ($F_{(1, 242)} = 0.02, p > .500$). Thus, support was found for Hypothesis 2.

Hypothesis 3. Hypothesis 3 proposed that, when faced with two tasks in which one is associated with an approach-framed superordinate goal whereas the other is associated with an avoidance-framed superordinate goal, the task associated with the avoidance goal will receive greater priority. Table 12 demonstrates that, as hypothesized, participants in this condition spent significantly more of their time focused on the task associated with the avoidance-framed superordinate goal ($F_{(1, 241)} = 7.61, p < .01$), spending 59% of their time on that task, compared to 41% of their time on the approach-framed task. This difference translates into 58 more seconds spent on the avoidance task than was spent on the approach task during each six-minute wave, or almost an additional 5 minutes on the avoidance task across the entire 30-minute scenario. Relative discrepancies also had a significant effect on resource allocation among participants in this condition, as they shifted their focus towards the task with the largest discrepancy ($F_{(1, 38)} = 7.02, p < .01$).

Examination of the two separate discrepancy values that compose the relative discrepancy variable reveals that discrepancies on the avoidance-framed task had much more influence on resource allocation than did discrepancies on the approach-framed task. In fact, among participants in this condition, discrepancies for the avoidance-framed task were a significant predictor of resource allocation ($\gamma = -.05, F_{(1, 38)} = 7.83, p <$

.01), whereas discrepancies on the approach-framed task were not significantly related to resource allocation ($\gamma = .02$, $F_{(1, 38)} = 1.38$, $p = .25$). Thus, participants in this condition devoted additional time to the avoidance-framed task when they felt they were further from the avoidance goal, and less time when they felt their progress towards the avoidance goal was sufficient. However, their progress towards attaining the approach-framed superordinate goal did not appear resource allocation.

Thus, as predicted, participants faced with a task with a task with an avoidance-framed superordinate goal, as well as a task with an approach-framed superordinate goal spent greater time focused on the avoidance-framed task. Additionally, their allocation of time to this task increased when they were confronted with performance-goal discrepancies on that task. Taken as a whole, these results provide strong support for Hypothesis 3.

Hypothesis 4. Hypothesis 4 proposed that, when both competing tasks are associated with *approach*-framed superordinate goals, prioritization would be influenced by relative discrepancies, such that greater priority will be given to the goal with the *smallest* discrepancy. As expected, among participants in this condition, relative discrepancies were a significant predictor of resource allocation ($\gamma = -0.09$, $F_{(1, 37)} = 74.86$, $p < .001$). However, the direction of the relationship was opposite of what was predicted, as participants tended to devote more time to whichever task had the *largest* discrepancy. Interestingly, when examining the two discrepancy components composing relative discrepancies, neither discrepancy variable predicted resource allocation. That is, discrepancies on the referent task ($\gamma = -0.003$, $F_{(1, 37)} = 0.2$, $p = .89$) and discrepancies on the non-referent task ($\gamma = 0.02$, $F_{(1, 37)} = 0.93$, $p = .34$) were – by themselves – unrelated

to resource allocation. However, as noted above, *relative* discrepancies were significantly related to resource allocation. Thus, it appears that within this condition, it is indeed the *difference* between discrepancies on the two tasks that influenced resource allocation. Nonetheless, because this relationship is opposite in direction from what was predicted, these results fail to support Hypothesis 4.

Hypothesis 5. Hypothesis 5 proposed that, when both tasks are associated with *avoidance*-framed superordinate goals, prioritization would be influenced by relative discrepancies, such that greater priority will be given to the goal with the *largest* discrepancy. As expected, among participants in this condition, relative discrepancies were a significant predictor of resource allocation ($\gamma = -0.08$, $F_{(1, 38)} = 23.64$, $p < .001$). Further, the direction of the relationship was such that participants tended to devote more time to whichever task had the *largest* discrepancy. As with the dual-approach condition described in Hypothesis 4 above, when examining the two discrepancy components composing relative discrepancies, neither discrepancy variable predicted resource allocation. Discrepancies on the referent task ($\gamma = -0.03$, $F_{(1, 38)} = 2.85$, $p = .10$) were only marginally related to resource allocation, whereas discrepancies on the non-referent task ($\gamma = 0.00$, $F_{(1, 38)} = 0.00$, $p = .98$) were unrelated to resource allocation. Again, this indicates that it is in fact the *difference* between discrepancies on the two tasks that influenced resource allocation. Thus, these results support Hypothesis 5.

Hypothesis 6. Hypothesis 6 proposed that, when no superordinate goals are provided for either task, prioritization would be influenced by relative discrepancies, such that greater priority will be given to the goal with the *largest* discrepancy. Consistent with expectations, relative discrepancies were a significant predictor of resource

allocation among participants receiving no superordinate goals for either task (γ = -0.05, $F_{(1, 35)} = 7.89, p < .01$). As predicted, the direction of the relationship was such that participants tended to devote more time to whichever task had the *largest* discrepancy. As with the two dual-superordinate-goal conditions described above, when examining the two discrepancy components composing relative discrepancies, neither discrepancy variable predicted resource allocation. Discrepancies on the referent task (γ = -0.01, $F_{(1, 38)} = 0.38, p = .54$) and discrepancies on the non-referent task ($\gamma = 0.01, F_{(1, 38)} = 0.26, p = .61$) were unrelated to resource allocation. However, *relative* discrepancies were significantly related to resource allocation, which again indicates that the *difference* between discrepancies on the two tasks influenced resource allocation, rather than the two discrepancies themselves. Thus, these results support Hypothesis 6.

Summary of relative discrepancy and condition analyses. Overall, strong support was found for the hypotheses concerning the relationships among relative discrepancies and condition. As predicted, condition and relative discrepancies interacted in their effects on resource allocation. That is, the relationship between relative discrepancies and resource allocation varied across conditions. Additionally, the nature of this interaction was largely as expected – four of the five hypotheses concerning the allocation of time within each of the specific experimental conditions were supported. The lone exception was for participants receiving approach-framed superordinate goals for *both* tasks. It was expected that these participants would tend to focus on the task that was *closest* to goal attainment. However, the opposite pattern emerged. Possible explanations for this finding and the implications of these results as a whole will be discussed in subsequent sections of this paper.

Approach and Avoidance Temperaments

Hypothesis 7. Hypothesis 7 proposed that individual differences in approach temperament, the framing of superordinate goals, and relative discrepancies would interact in their influence resource allocation. This hypothesis was tested in three stages. First, the main effect of approach temperament was added to the model tested in Hypothesis 1 above, including ability as a covariate, condition, relative discrepancies, and the interaction of relative discrepancies and condition. Next, two-way interactions between approach temperament and condition as well as approach temperament and relative discrepancies were added. Finally, the three-way interaction between approach temperament, condition, and relative discrepancies was added.

When adding the main effect of approach temperament to the model including ability, condition, relative discrepancies, and the discrepancy X condition interaction, approach temperament was not significantly related to resource allocation ($\gamma = 0.03$, $F_{(1, 239)} = 2.20$, $p = .14$). When adding the two-way interaction terms, the approach temperament X condition interaction ($F_{(5, 234)} = 2.23$, $p = .17$) and the approach temperament X relative discrepancy interaction ($F_{(1, 234)} = 0.00$, $p = .97$) both failed to reach significance. The addition of the three-way interaction between condition, relative discrepancies, and approach temperament also failed to account for significant variance in resource allocation. Thus, no support was found for Hypothesis 7.

Hypothesis 8. Hypothesis 8 proposed that individual differences in avoidance temperament, the framing of superordinate goals, and relative discrepancies would interact in their influence resource allocation. The test of this hypothesis followed the same three stages as described above with respect to approach temperament. When

adding the main effect of avoidance temperament to the model including ability, condition, relative discrepancies, and the discrepancy X condition interaction, avoidance temperament was not significantly related to resource allocation (γ = -0.01, $F_{(1, 239)}$ = 0.99, p = .32). When adding the two-way interaction terms, the avoidance temperament X condition interaction ($F_{(5, 234)}$ = 0.60, p = .70) and the avoidance temperament X relative discrepancy interaction ($F_{(1, 234)}$ = 0.67, p = .42) both failed to reach significance. The addition of the three-way interaction between condition, relative discrepancies, and avoidance temperament also failed to account for significant variance in resource allocation. Thus, Hypothesis 8 was not supported.

Exploratory Analyses

Given how little theoretical and empirical work currently exists on the topic of multiple goal self-regulation, a secondary objective of this study was to explore aspects of this process for which insufficient information exists to form and conceptually support formal hypotheses. Such exploratory analyses can provide valuable insights into this important, complex, and under-explored topic that can help to stimulate and inform future theory development and testing. While countless aspects of the process could be examined, the exploratory analyses reported here focus primarily upon the influence of two factors – time and self-efficacy. Although some of these analyses speak to both of these constructs, they are presented within the section that best captures the core issues examined in each analysis.

Effects of Time on Multiple-Goal Self-Regulation

The first set of exploratory analyses concern the role of time in the allocation of resources to competing goals. While existing theory and research on self-regulation and

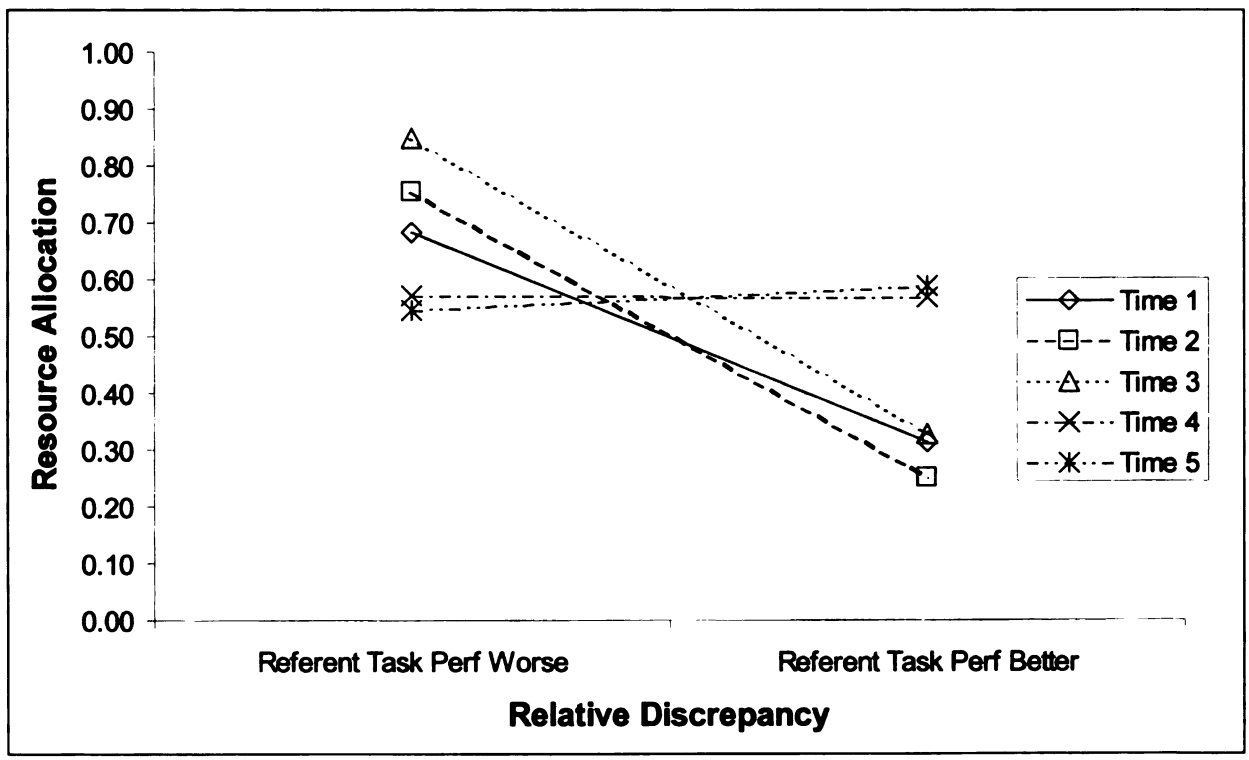
the role of discrepancies focuses upon processes that *unfold* over time, relatively little attention has been given to how these processes may *change* over time. The pursuit of many goals is bounded by time, in that there may be a limited period of time during which the goal may be pursued and obtained. For example, a student with a specific goal for a particular course only has until the end of the semester to pursue and potentially obtain this goal. Such deadlines may have a profound impact on goal-related processes, yet they have received very little attention to date.

Thus, while time may play an important role in the prioritization of competing goals, insufficient work exists to pose specific, defensible hypotheses concerning the impact of time on dual-goal self-regulatory processes. Nonetheless, it may be informative to utilize the unique data provided by the current study to explore the impact of time on goal prioritization. Given the nature of the data in this study, direct effects of time on resource allocation are unlikely to be observed. Indeed, no such main effect of time was observed ($F_{(4, 247)} = 1.02, p = .40$). However, time may serve as a moderator, changing the strength or even the direction of influence of other processes as the simulation progresses. Three such interactions will be examined below: the interaction of time and relative discrepancies, the interaction of time and condition, and the three-way interaction of time, condition, and relative discrepancies.

The first time-based exploratory analysis yielded a significant interaction between time and relative discrepancies ($F_{(3, 247)} = 84.05, p < .001$). This interaction is displayed in Figure 6. Aside from a slight increase from waves 1 to 2, the relationship between relative discrepancies decreased over time, reversing direction during the final wave. That is, during earlier waves, participants tended to increase the time spent on whichever

task had a *larger* discrepancy. However, during the final two waves, this relationship reversed, with a modest but significant relationship in the opposite direction during the final wave ($F_{(1, 247)} = 3.88, p < .05$), such that participants increased the time spent on the task with the *smallest* discrepancy. Thus, it appears that the impending deadline led participants to revise their strategies for allocating time across the two competing tasks. Interestingly, while a significant interaction was observed between time and relative *perceived* discrepancies ($F_{(4, 247)} = 2.52, p < .05$), this interaction was smaller in magnitude than that found with relative *true* discrepancies. Additionally, although the overall pattern of this interaction was similar to that for relative true discrepancies, no reversal was found during the final time period.

Figure 6. Interaction of relative discrepancies and time.



The second time-based exploratory analysis was to examine the potential interaction between condition and time. No such interaction was observed ($F_{(20, 242)}$ = 1.05, p = .40). Rather, the main effect of condition reported above was consistent across all time periods. However, there was a marginal three-way interaction between relative perceived discrepancies, condition, and time ($F_{(20, 242)}$ = 1.48, p = .08), which is displayed in Figure 7. The nature of this interaction is fairly complex. For the most part, the strength of the relationship between relative perceived discrepancies and resource allocation changed in magnitude over time, but these changes do not appear to follow a particularly systematic pattern. Additionally, with two exceptions, the direction of the relationship does not change. The two exceptions involve the dual-approach condition and the approach-and-avoidance condition. For the dual-approach condition, the direction of the relationship between relative perceived discrepancies and resource allocation was slightly reversed during wave 3, such that participants increased their focus on the task with the *smallest* discrepancies – at all other time points, this relationship was in the opposite direction. For the approach-and-avoid condition, the relationship changes direction during the final time period, such that participants increased their focus on the task with the *smallest* discrepancies – at all other time points, this relationship was in the opposite direction. However, when restricting analyses to the approach-and-avoid condition only, the interaction of time and relative discrepancies is not significant. Overall, while the three-way interaction of relative discrepancies, condition, and time is potentially interesting, the pattern of this interaction makes interpretations difficult at best and calls into question the veracity of the finding.

Figure 7. Three-way interaction of time, condition, and relative discrepancies on time allocation.

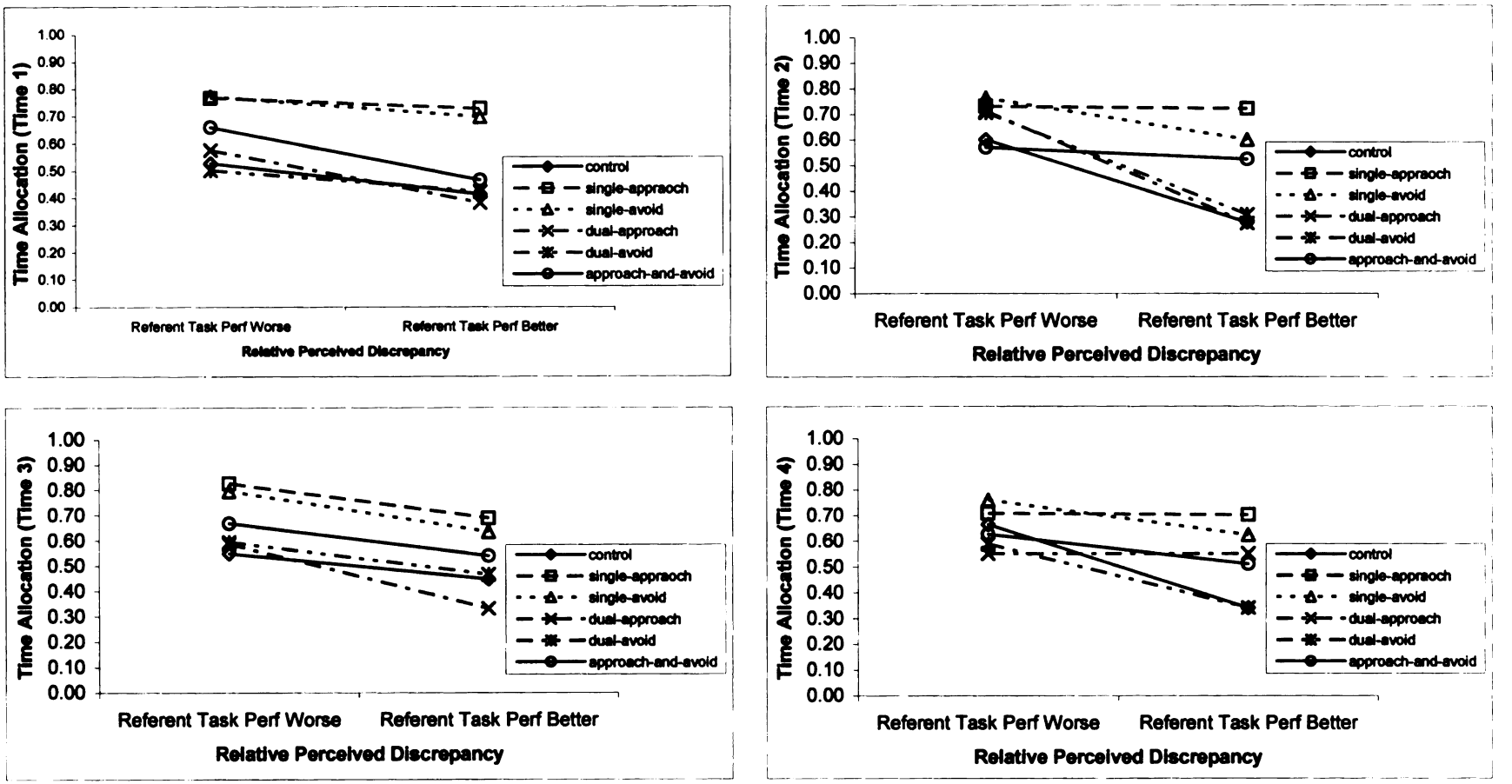
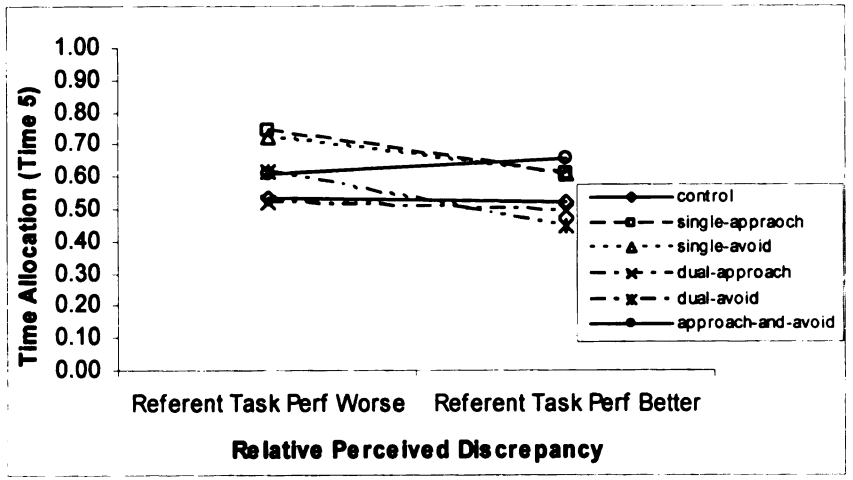


Figure 7 (cont.)



Self-Efficacy

The role of self-efficacy in self-regulation has long been of interest to motivational researchers. It has previously been found to have complex, reciprocal relationships with numerous aspects of the self-regulatory process (Bandura, 1997). Additionally, the nature of the relationship between self-efficacy and outcomes such as performance has been found to differ in direction depending upon the manner in which one examines it (e.g., Vancouver et al., 2001). More specifically, when looking between subjects, positive relationships are typically observed. However, some evidence suggests that, when looking within person, self-efficacy can actually be *negatively* related to outcomes such as performance. This suggests that self-efficacy may be even more complex than typically thought, and different processes may be responsible for the positive between person effect and the potentially negative within person effect.

When considering the role of self-efficacy in a dual-goal context, the situation gets yet more complex. Self-efficacy likely exhibits direct effects on resource allocation – the above mentioned issues concerning between- and within- person effects are likely as relevant in dual-goal contexts as it has been shown to be in multiple-goal contexts. Additionally, in dual-goal contexts, *relative* self-efficacy may be as influential, if not more so, than the simple level of self-efficacy for the two tasks alone. Additionally, like time and goal attainment, self-efficacy may function as a moderator of other processes discussed above. In fact, there are countless unique and interesting questions that could be examined concerning self-efficacy within a dual-goal context – more than can be adequately addressed herein. Thus, I report on a narrow slice of observations regarding self-efficacy within a dual-goal context, focusing on the direct effects of self-efficacy and

relative self-efficacy, interactions between self-efficacy and relative discrepancies, interactions between self-efficacy and condition, and three-way interactions between self-efficacy, relative discrepancies, and condition.

The first set of exploratory self-efficacy effects examined the direct effects of self-efficacy for both tasks on resource allocation. Again, it is important to distinguish the between- and within-person relationships of self-efficacy, as they can result in very different interpretations and conclusions. Thus, to clearly distinguish the between- and within-person relationships, the average level of self-efficacy for each task was included to capture the between person relationships, whereas the person-centered self-efficacy for each task was included to capture the within-person relationships (see Hoffman & Gaven, 1998 for a discussion of the use of group-centering and group-averages to separate between- and within-group/person effects). Group-averaged self-efficacy for the referent-task was positively related to the allocation of time to the referent task ($\gamma = 0.09$ $F_{(1, 245)} = 312.41, p < .001$), whereas group-averaged self-efficacy for the *non-referent* task was negatively related to the allocation of time to the referent task ($\gamma = -0.09$ $F_{(1, 245)} = 323.11, p < .001$). In other words, when examining the *between-person* effects, individuals with more confidence for either task was associated with more time allocated to that task.

However, the within-person effects tell a different story. Within-person self-efficacy for the referent task was negatively related to time allocated to the referent task ($\gamma = -0.03$ $F_{(1, 245)} = 12.16, p < .001$), whereas within-person self-efficacy for the non-referent task was positively related to time allocated to the referent task ($\gamma = 0.02$ $F_{(1, 245)} = 6.49, p < .01$). Thus, when examining the *within-person* effects of self-efficacy, it

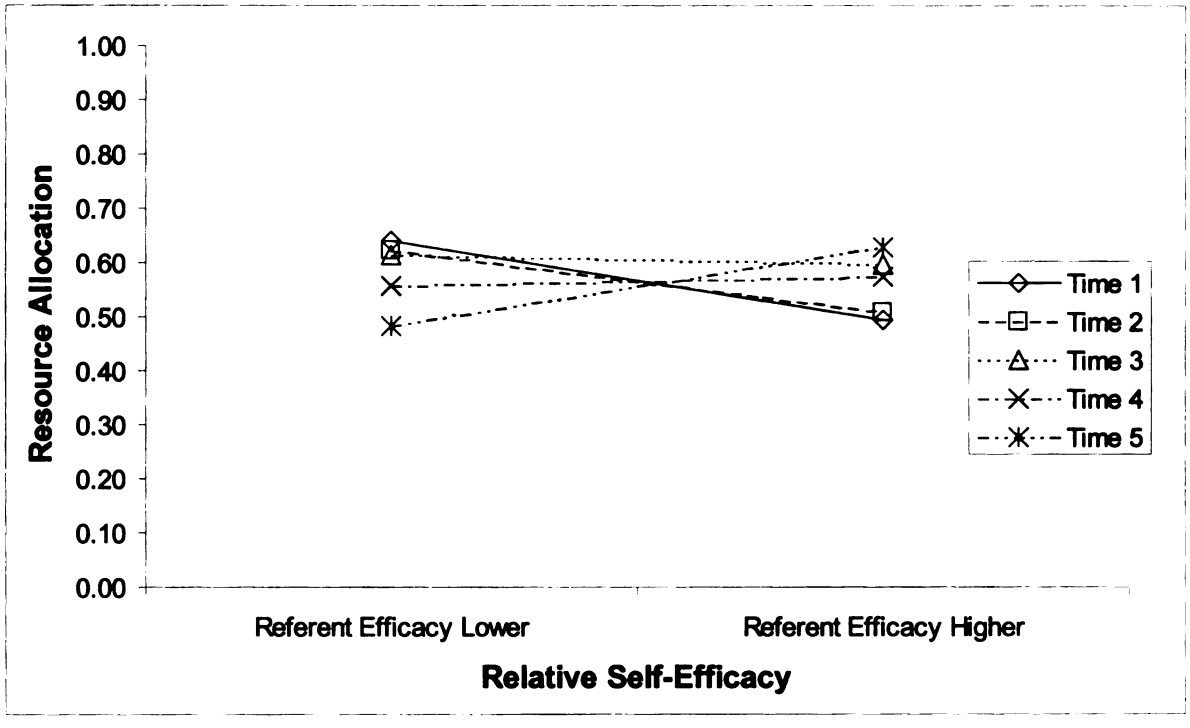
appears that when individuals had higher confidence for either task, they tended to decrease the time allocated to that task, instead spending that time on the other task.

Given the conflicting nature of the tasks in this study and the conflicting results that emerge from the between and within-person relationships of self-efficacy, it may also be informative to examine the relationship between *relative* self-efficacy and resource allocation. Again, the issue of between- and within-person variance becomes critical. Without centering relative self-efficacy, the results suggest that participants tended to focus on the task for which they had *greater* efficacy ($\gamma = 0.04$ $F_{(1, 247)} = 151.28$, $p < .001$). However, when the between- and within-person variance is distinguished by utilizing group-averaged and group-centered relative self-efficacy, a more complete story emerges. Group-averaged relative self-efficacy was positively related with resource allocation ($\gamma = 0.09$ $F_{(1, 246)} = 525.75$, $p < .001$), suggesting that *individuals* who had greater efficacy for the referent task spent more time on that task, and vice versa. In contrast, group-centered relative self-efficacy was negatively related to resource allocation ($\gamma = -0.02$ $F_{(1, 246)} = 12.84$, $p < .001$), such that participants tended to increase their focus on the task for which they had the *least* efficacy.

Like relative discrepancies, it may be the case that the manner in which relative self-efficacy is related to resource allocation may change over the course of the simulation. A significant interaction between relative self-efficacy and time was observed ($F_{(4, 247)} = 14.31$, $p < .001$). This interaction is displayed in Figure 8. Early in the simulation, participants tended to focus on the task with the *lowest* self-efficacy, whereas later in the simulation participants focused on the task with the *greatest* efficacy. The early focus on the task with the lowest efficacy may reflect an attempt to improve on

the task that is perceived as deficient, most likely in an attempt to meet both goals. However, as the deadline nears, participants may have believed that meeting both goals was unlikely and, as a result, chose to focus on the goal they felt they had the best chance of attaining.

Figure 8. Interaction of relative self-efficacy and time.



The interaction of relative discrepancies and relative self-efficacy were examined next. It may be that relative discrepancies have different impacts on resource allocation depending upon individuals' efficacy for the two tasks. The interaction between relative self-efficacy and relative discrepancies was not significant ($\gamma = 0.00$ $F_{(1, 247)} = 2.00, p = .16$). Additionally, the two-way interaction of relative self-efficacy and condition was non-significant ($F_{(5, 242)} = 1.61, p = .16$). However, a small three-way interaction of relative self-efficacy, relative *true* discrepancies, and condition was observed ($F_{(5, 242)} =$

4.54, $p < .001$), with relative discrepancies and relative self-efficacy group-centered to focus on the within-person relationships. This interaction is displayed in Figure 9. As Figure 9 shows, the most pronounced effects are the main effects of relative discrepancies and relative self-efficacy. With the exception of the approach-and-avoid condition, the combination a relatively large discrepancy on a task and relatively high efficacy for that task resulted in the greatest resource allocation of time to that task. Within the approach-and-avoid condition, relative discrepancies had little impact on resource allocation, with the largest impact being due to relative self-efficacy.

While the finding of a 3-way interaction between self-efficacy relative *true* discrepancies, and condition is interesting, there are a number of factors that raise questions about the validity of this interaction. First, this interaction was not replicated with relative *perceived* discrepancies ($F_{(5, 242)} = 0.40$, $p = .85$). More important is the fact that several interpretations suggested by the interaction plots are inconsistent with those suggested by simpler analyses reported earlier. For example, these plots suggest that the overall relationship between relative self-efficacy and resource allocation is such that individuals focus on the task for which they have greater efficacy. While this was found to be the case for group-averaged self-efficacy reported above, the relationship with group-centered self-efficacy was the opposite – that is, the overall within person relationship between relative self-efficacy and resource allocation was found to be such that individuals tended to increase the focus on the task for which they had the *least* efficacy, although this pattern did reverse itself over time. Nonetheless, the results of the three-way interaction suggest that the overall within-person relationship is opposite of what was found in the simpler analyses.

It may be that, once the covariance shared between self-efficacy and discrepancies is removed, as it is in these analyses (i.e. Type III/incremental effects), a different pattern of relationships emerges. It may also be that the nature of this three-way interaction varies over time. Although some evidence of such a four-way interaction was found in this dataset ($F_{(5, 242)} = 1.74, p < .05$), the interaction appears to be small in magnitude. More importantly, interpretation of such high-level interaction terms frequently proves to be immensely difficult, as does replication. Regardless, these results suggest that much work remains to be done to fully understand the relationships among self-regulatory constructs in multiple-goal contexts.

Figure 9. Three-way interaction of relative condition, relative discrepancies, and relative self-efficacy.

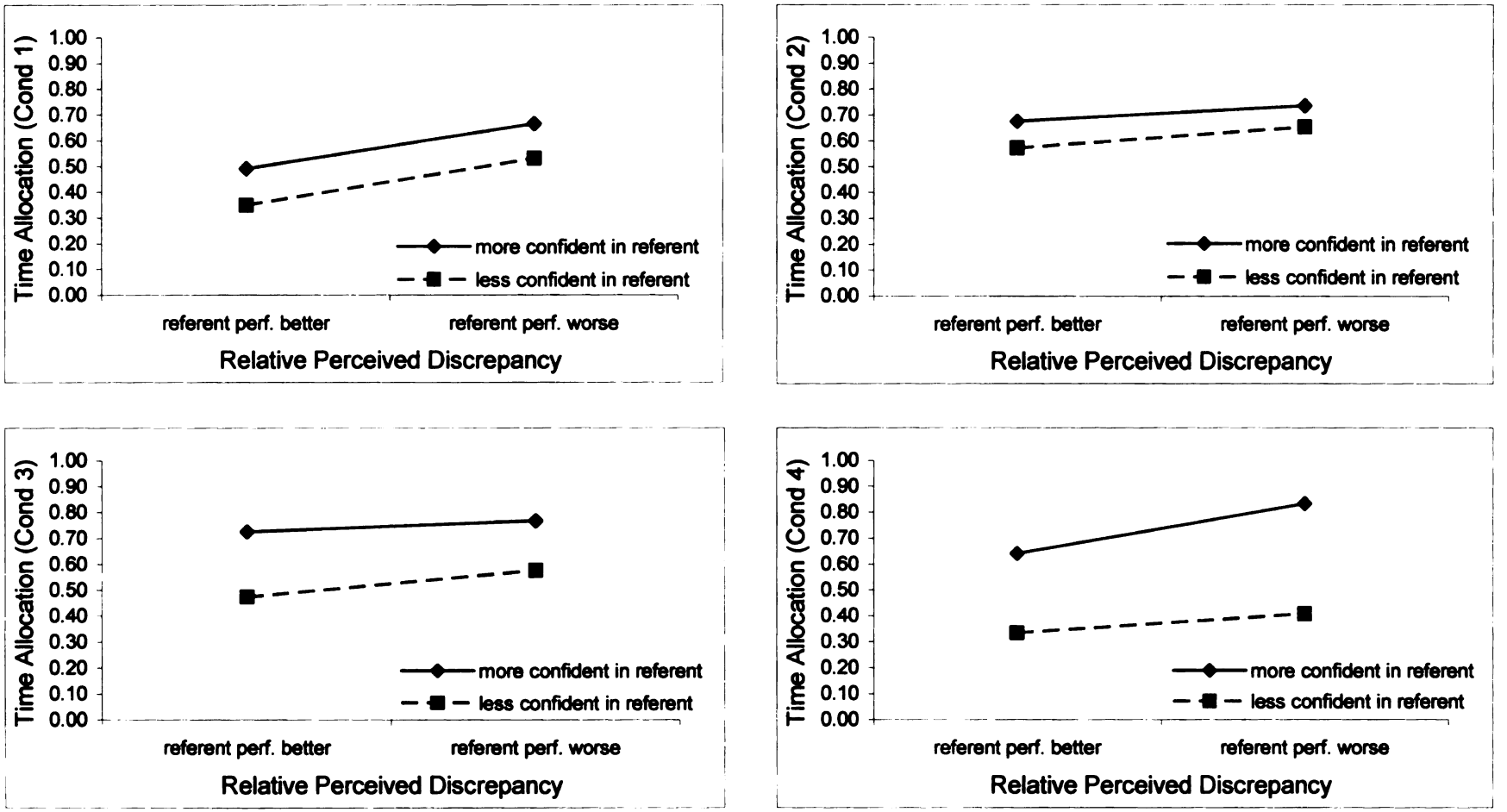
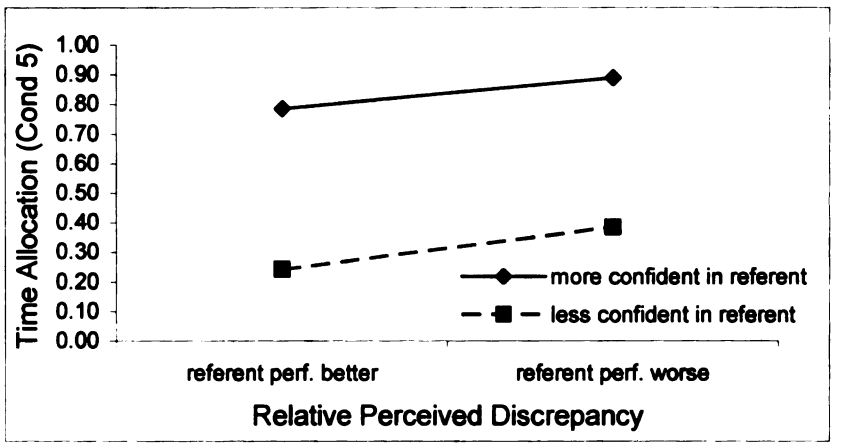
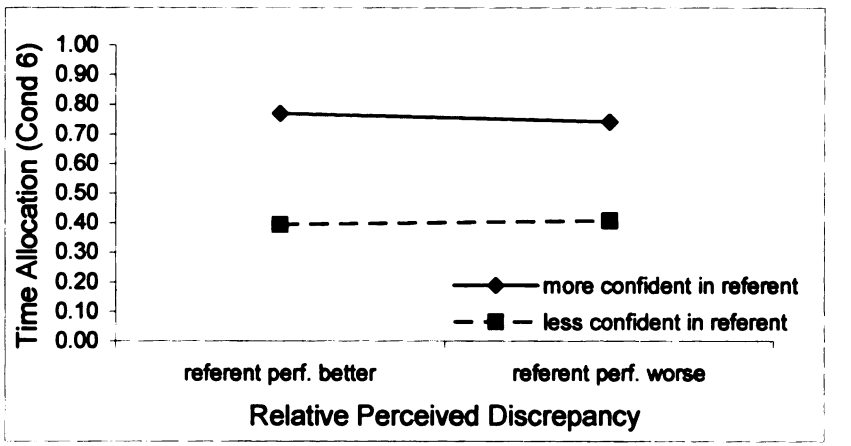


Figure 9 (cont.).





DISCUSSION

Despite the ubiquitous nature of multiple goal pursuits within the workplace and beyond, very little theoretical or empirical attention has been directed towards understanding how individuals pursue multiple goals over time. The purpose of this study was to address this gap by examining self-regulatory processes within a multiple-goal context. In particular, this study examined the role of goal-performance discrepancies on the prioritization of competing goals over time, as well as the influence of superordinate goals and approach and avoidance temperaments on that process. A conceptual model was developed that describes the proposed processes involved in the dynamic prioritization of competing goals. The model proposes that the existence and framing of superordinate goals moderate the relationship between discrepancies and subsequent allocation of resources between the two tasks. Additionally, it was proposed that individual differences in approach and avoidance temperaments would accentuate the influence of superordinate goal framing on the prioritization process.

Support was found for many of the key study hypotheses. In particular, superordinate goals moderated the relationship between relative discrepancies and resource allocation. The overall pattern concerning the relationship between relative discrepancies and resource allocation was such that individuals tended to increase their focus on whichever task had the largest discrepancy – that is, the task for which the performance level was furthest from the goal. As predicted, this relationship varied as a function of superordinate goals. The magnitude of the relationship between relative discrepancies and resource allocation varied across conditions, although the direction of the relationship did not. In all conditions, the overall tendency was to allocate additional

time to whichever task had the largest discrepancy, but this tendency was more pronounced in some conditions than in others.

With one exception, support was also found for the hypotheses concerning the specific manner in which discrepancies and superordinate goals would influence resource allocation within each combination of superordinate goals. Within the control condition, in which no superordinate goals were associated with either task, participants allocated their time equally across both tasks. This was expected, as the tasks were essentially equivalent, with no superordinate goals associated with either task. Thus, there should be little motive for participants to exhibit an overall tendency to focus more heavily upon one task than the other. Rather, as expected, prioritization among participants in the control condition was influenced by relative discrepancies, such that these participants would allocate more time to whichever task was experiencing the greatest discrepancy at the time. While this finding is largely consistent with the indirect implications of control theory models of self-regulation (e.g., Carver & Scheier, 1996; Klein, 1989; Powers, 1973), this study provides direct empirical support for an explicit hypothesis regarding this relationship.

This finding is consistent with the results reported by Vancouver (1997), who examined the relationship between past-performance/discrepancies for conflicting quantity and quality goals on an investment task, with no superordinate goals associated with meeting either goal. He found that lower past performance on the *quantity* goal was related to greater subsequent performance on that aspect of performance, and vice-versa. Additionally, he found that lower past performance on the *quality* goal was related to greater subsequent performance on that aspect of performance. The implication drawn

from these results was that individuals allocated more resources towards whichever aspect of performance was most deficient. However, as discussed earlier, the Vancouver study did not provide a *direct* test of that proposition, as he only reported the relationship between past and current performance on the same goal (i.e. past *quality* performance related to subsequent *quality* performance, past *quantity* performance related to subsequent *quantity* performance), prohibiting any direct conclusions about how *relative* discrepancies influence subsequent performance on the two goals. Among the contributions of the current study is that the results from the control condition provide a direct test of this proposition, finding support for the notion that, in the absence of superordinate goals, individuals tend to allocate more resources to goals that are experiencing the largest discrepancies.

As expected, in the two conditions in which a superordinate goal was presented for only one of the two tasks, participants focused heavily upon the task with the superordinate goal. This is not surprising, as the directing quality of externally set goals is purported as a primary mechanism underlying goal-setting effects (e.g., Locke & Latham, 1990). With a superordinate goal for only one task, individuals are directed towards that task, with little opposing pull from the alternative task possessing no superordinate goals. These results are consistent with the single-goal condition in Kernan and Lord (1990), who found that providing a lottery entry only for meeting the goal associated with one of the two tasks led to almost exclusive focus on the task associated with the lottery entry. This finding is not surprising, as superordinate goals can influence the importance or value of goal attainment. According to Hyland's (1988) model of motivation, superordinate goals influence how strongly individuals react to discrepancies

of a given objective size (i.e. error sensitivity). With a superordinate goal associated with only one of two tasks, individuals' reactions to discrepancies on the task with no superordinate goal are muted at best. Additional analyses revealed that, while discrepancies on the task with the superordinate goal influenced resource allocation, discrepancies on the other task did not.

Additionally, the framing of the superordinate goal had no effect in the conditions with a superordinate goal for only one task. While superordinate goal framing was expected to have important influences when *two* superordinate goals were provided, framing was not hypothesized to influence prioritization in the single-superordinate-goal conditions. Rather, it was expected that a superordinate goal for only one task would provide such a strong pull towards the task associated with the superordinate goal that further influences of framing would be weak or non-existent. While null-hypotheses are difficult to support empirically (e.g., Cohen, 1994; Schmidt, 1996), the results for the conditions with a single superordinate goal, which differed in the framing of the superordinate goal, were virtually identical throughout. This provides further indication of the power of superordinate goals to influence prioritization.

Whereas the results of the single-superordinate-goal conditions showed the influence of the *presence vs. absence* of superordinate goals, the results emerging from the combination of an approach and an avoidance superordinate goal demonstrate the influence of the *framing* of superordinate goals. As predicted, participants gave greater priority to the task associated with the avoidance-framed superordinate goal, allocating significantly more resources to that task than to the task with an approach-framed superordinate goal. This finding is consistent with a large body of literature on framing

effects and loss aversion in decision making (e.g., Kahneman & Tversky, 1979; Kahneman, Knetsch, & Thaler, 1991; Thaler, 1980;). This literature has demonstrated a strong tendency towards loss aversion and the associated asymmetry between gains and losses. Simply put, individuals tend to be more sensitive to losses than to gains, attaching greater value to avoiding losses than to attaining gains of an equivalent amount (Kahneman & Tversky, 1979). This is the first study to examine the implications of framing effects for the prioritization of multiple conflicting goals and represents another key contribution of this study.

Incorporating Hyland's control theory model, it was also expected that the framing of superordinate goals would influence the sensitivity to discrepancies between goals and performance. Thus, among participants provided with both an approach and avoidance framed superordinate goal, it was predicted that discrepancies on the avoidance-framed task would further influence resource allocation. Indeed, the results supported this contention. Relative discrepancies significantly influenced resource allocation, indicating that individuals allocated additional resources the task with the greatest discrepancy – this suggests that the discrepancies for *both* tasks influenced resource allocation, albeit in opposite ways (cf. Edwards & Parry, 1993); However, examining the two discrepancy components directly (i.e. as opposed to their difference score) revealed that, as expected, discrepancies on the *avoidance* task significantly predicted resource allocation, whereas discrepancies on the *approach* task did not. Thus, not only did participants demonstrate an overall tendency to favor the avoidance task, but also they were more sensitive to and more strongly influenced by discrepancies on the avoidance task.

Also consistent with expectations, those presented with two avoidance-framed superordinate goals allocated their time equally across both tasks. As in the control condition, the tasks were essentially equivalent, although in this case both tasks were associated with superordinate goals, which were equal in magnitude and in their framing. Thus, unlike the single-superordinate-goal conditions and the approach-and-avoidance condition, there should be little rationale for participants to demonstrate a general preference to focus more heavily upon one task than the other, without consideration of other factors such as relative discrepancies. Rather, it was predicted and found that participants presented with an avoidance-framed superordinate goal for both tasks would allocate more time to whichever task was experiencing the greatest discrepancy at the time. Although the results are consistent with the theoretical rationale, the fact that the dual-approach condition showed a similar pattern of results limits the ability to draw firm conclusions about what mechanisms are responsible for this effect within the dual-avoidance condition – this issue will be discussed in greater depth in a subsequent section focused on the theoretical implications of this study.

Unexpected Results

While many of the relationships among the key study variables were as expected, several unexpected results emerged as well. Given the dearth of theoretical and empirical work on dynamic goal prioritization, careful analysis of these unexpected results – particularly those that conflict with prior studies – may yield important insights that can inform future work in this area, perhaps ultimately leading to advances in our understanding of this highly complex phenomenon.

Relative discrepancies with two approach-framed superordinate goals. It was hypothesized that the resource allocation of participants presented with two approach-framed superordinate goals would be influenced by relative discrepancies on the two tasks, such that additional resources would be allocated to whichever task had the *smallest* discrepancy. While relative discrepancies had a significant relationship with resource allocation, the direction of the relationship was opposite of expectations, as participants receiving two approach-framed superordinate goals allocated additional resources to the task with the largest discrepancy. This result conflicts with that reported by Kernan and Lord (1990). Recall that Kernan and Lord offered participants an entry into a lottery for meeting the performance goal associated with each of the two tasks – thus, meeting the goal for one task resulted in one entry, whereas meeting the goal for both tasks resulted in two lottery entries. This essentially represents an approach-framed superordinate goal associated with each task, and thus resembles the dual-approach condition in the current study. However, Kernan and Lord found that participants gave greater priority to the task with the *smallest* discrepancy, rather the task with the *largest* discrepancy, as was the case in this study. Again, exploring possible explanations for these differences may prove useful for directing future work in this area.

One possible explanation for these conflicting results concerns differences in the nature of the superordinate goals in the two studies. First, the lottery entries in the Kernan and Lord study were gained based on per-trial performance (ex. gain one lottery entry by creating 18 invoices during at least one of the three trials), rather than on cumulative performance across the entire study (ex. gain one lottery entry by creating 54 total invoices during all three trials combined), as in the current study. Additionally, the

goals were terminal in that, once the target level of performance was met for a task, performance on that task was no longer relevant for attaining superordinate goals. Thus, if a participant attained the goal (and acquired the lottery entry) associated with the invoice task on the first trial, performance on the invoice task on subsequent trials would have no implications for the superordinate goal of attaining lottery entries – the lottery entry had already been won, and subsequent high performance on that task could not result in another lottery entry, nor could subsequent poor performance result in one losing their lottery entry.

In contrast, in this study, the superordinate goals were continuous in nature, as they were associated with meeting the performance goals *at the end* of the simulation (ex. no ABC College students in waiting in line when the simulation ends). Thus, if a participant had created schedules for all ABC College students by the end of the first time period and, therefore, at least temporarily achieving a level of performance consistent with the superordinate goal for that task, this was no guarantee that the superordinate goal had actually been attained. Rather, attaining the superordinate goal depended upon meeting the goal of no students in line *at the end* of the simulation – because additional students joined the lines throughout the simulation, if one created schedules for all students in one line early in the study and then neglected that line for the remainder of the simulation, it is very unlikely that they would attain the superordinate goal for that task.

These differences may have important implications for how participants dealt with the competing goals in these two studies. Participants in the Kernan and Lord study may have recognized that the best chance to maximize one's lottery entries is to focus predominantly or exclusively on only one task within a given trial. Again, because the

superordinate goals in their task were associated with achieving the per-trial performance goals, focusing on only one task per-trial gives one the best chance of meeting the target level of performance on that task – if one split their time between the two tasks *within a trial*, they would have a greater chance of falling short of both goals on that trial. If one did focus predominately on a single task during the first trial, but did not meet the goal on that trial, their best chance of obtaining a lottery entry would likely come from continuing to focus on that task during the next trial – the experience acquired on the first trial would likely help one to improve their performance to the point where goal attainment is more feasible. In fact, the only conditions under which it would seem logical to shift one's focus from one task to the other are if a) the first task goal has already been met, or b) one concludes that they are unlikely to meet the goal for the first task and are more likely to meet the goal for the second task. Thus, with this task structure, there is little to be gained from splitting one's time between the two tasks *within a trial* but, rather, the benefits are most likely to accrue from working exclusively on one until it is met, then focusing on the other task during any remaining trials.

If participants did in fact employ such a strategy in the Kernan and Lord study, the results would be consistent with what they observed. Participants who focused predominately on one task during the first trial would have smaller discrepancies on that task – because they continue focusing on that task during the next trail, they would be focusing on the task with the *smallest* discrepancy. If they were to meet the goal on one task prior to the final trial, they would then likely focus on the other task – thus, they would then be focusing on the task with the *largest* discrepancy. However, relatively few participants in their sample met the goal for either task prior to the final trial. More

importantly, those that did were excluded from their analyses as Kernan and Lord recognized and noted that, based on the reward structure utilized in their task, these individuals were almost certain to then shift their focus to the alternative task. Thus, the nature of their task and the lottery entries they utilized made it such that individuals were best rewarded for employing a strategy wherein they focused on the task with the *smallest* discrepancy. Further, those participants that were most likely to focus on the task with the *largest* discrepancy were excluded form their analyses.

In the current study, the type of "sequential" strategy described above for dealing with the conflicting goals and maximizing one's attainment of the associated superordinate goals is less likely to be successfully implemented. The uncertainty brought about by the environmental disturbances (i.e. new students joining the lines) combined with the fact that the superordinate goals were associated with the number of students in line at the *end* of the simulation means that participants cannot be certain at early stages of the study if their performance on a given task is sufficient to meet the superordinate goal without further investment of effort in that task at later points in the simulation. Given the difficulties involved in utilizing the sequential strategy in this context, participants appear to have concluded that, in general, the best approach was to focus on whichever task was furthest from the goal.

There is another potentially important implication of the different task and goal structures between these two studies, this one concerning differences in perceived time pressure that participants may have felt as they performed the tasks. Again, Kernan and Lord utilized three trials, each lasting 10 minutes, whereas the current study utilized a single 30-minute simulation that was divided into five six-minute waves. Although the

total time for performance in both studies was 30 minutes, in the Kernan and Lord study, this essentially amounted to three discrete attempts to attain the goals. Although participants had three trials and a total of 30 minutes in which to meet the goals, performance on prior trials did not carry over to subsequent trials. Thus, they had to process the target number of invoices and/or requisitions within one of the three 10-minutes trials. Thus, participants may have felt a great deal of time pressure throughout each 10-minute trial, leading them to conclude that meeting *both* goals during any single trial was unlikely. Such a conclusion seems likely to lead one to focus predominately on whichever task they felt they had the best chance to meet during the next trial, then perhaps shifting their focus to the other task on a future trial.

In contrast, in the current study, performance and goal pursuit was an ongoing endeavor. Although the 30-minute simulation was separated into five six-minute waves to facilitate assessment of several critical self-report measures, these waves were *not* discrete – each new wave picked up where the previous wave left off. Thus, participants had a single 30-minute time period to meet the goals. Early in the simulation, participants may have felt relatively little time pressure, as a considerable amount of time remained to meet the goals. As such, they may have felt the best strategy at that point was to perform as well as possible on both tasks, focusing at any given time on whichever task was furthest from goal attainment – the lack of time pressure may have led to a belief that they need not sacrifice one task to meet the goal for the other. However, as the deadline approached, many participants may have recognized that they would be unable to meet the goal for both tasks. This realization may have led these participants to shift their strategy from focusing on the task with the largest discrepancy

to focusing on the task with the smallest discrepancy, as the task with the smallest discrepancy is the most likely to be attained. Indeed, the significant interaction of relative discrepancies and time demonstrated the pattern of results that would be expected from such a process. However, additional research is needed to confirm whether this process is truly responsible for the interaction of relative discrepancies and time.

Individual difference effects on prioritization. Another surprising result was the failure of individual differences to predict resource allocation. It was expected that approach and avoidance temperaments would moderate the relationship between relative discrepancies and resource allocation. More specifically, the nature of this interaction was expected to vary across conditions, resulting in a three-way interaction of approach temperament, relative discrepancies, and condition, as well as a three-way of avoidance temperament, relative discrepancies, and condition on resource allocation. However, no effects of approach and avoidance temperaments on resource allocation were found, whether examined as direct effects, as part of two-way interactions (ex. approach temperament X relative discrepancy, approach temperament X condition, approach temperament X avoidance temperament, etc.), or as part of the hypothesized three-way interactions.

Approach and avoidance temperaments were created by following the methodology forwarded by Elliot and Thrash (2002). Specifically, extraversion, neuroticism, positive affectivity, negative affectivity, behavioral activation system, and behavioral inhibition system were factor analyzed, resulting in two factors representing approach and avoidance temperaments – approach and avoidance temperaments were operationalized as factor scores created from these analyses. Given the relative novelty

of this approach, one might suspect that deficiencies in the procedure for combining the various measures into approach and avoidance temperaments could be responsible for their lack of influence on resource allocation. If this were the case, one might be more likely to observe effects for the specific measures composing the temperaments. However, this was not the case – even when examining the components (i.e. extraversion, neuroticism, positive affectivity, negative affectivity, behavioral activation system, and behavioral inhibition system), rather than the resulting factor scores, no effects were found for the individual difference measures.

Another possible explanation for the lack of significant effects involving approach and avoidance temperaments concerns environmental characteristics of the experimental context in this study. Although it was expected that a dual-goal context would represent a relatively *weak* situation, as there are multiple avenues of acceptable behavior that individuals could take, characteristics of the task environment may have, in fact, created a relatively *strong* situation, in which most individuals behaved in a similar fashion. In particular, it is possible that the provision of feedback at all points during the simulation may have created a relatively strong press towards balancing the two goals.

Feedback frequency has been identified as a factor with strong impacts on self-regulatory outcomes, affecting – among other things – how "tightly" behavior is controlled (e.g., Carver & Scheier, 1998; Powers, 1973; Taylor, Fisher, & Ilgen, 1984). When feedback is only available infrequently, it is difficult to emit the precise types and amount of behaviors that are needed to achieve the goal – individuals are thus prone to executing inappropriate behaviors, too much of a necessary behavior, too little of a necessary behavior, etc. When feedback is available more frequently, individuals can

more readily adapt the types and amount of behaviors that are enacted to match what is necessary to achieve the goal.

Because feedback was clearly visible at all points during the simulation, participants were likely very aware of the behaviors that were needed to meet the goals for the two tasks. With less frequent feedback, individuals are required to make some guesses and estimates about how well they are progressing toward their goals. Individual differences, such as approach and avoidance temperaments, are likely to bear influence on these estimates, helping to contribute to the large amounts of variance in performance (i.e. "sloppy" control) that is typically seen when feedback is infrequent (e.g., Klein, 1989; Taylor et al., 1984). However, when feedback is provided frequently and unambiguously, these estimates of performance are unnecessary, which may serve to reduce one avenue by which individual differences influence self-regulatory processes. This may have reduced the influence of individual differences in approach and avoidance temperaments.

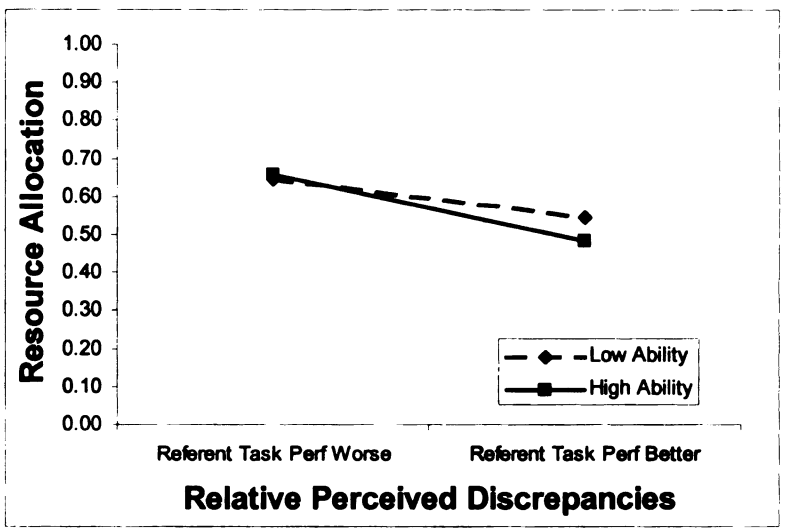
In addition to providing more clear and regular information to participants concerning the behaviors necessary to attain the goals, the continuous display of feedback may also have made both goals very salient. In many situations in which individuals have multiple goals they are attempting to attain, selecting one goal to focus upon at a given point in time may lead individuals to temporarily lose sight of other competing goals. It is unclear what factors lead individuals to regain awareness of and shift attention to competing goals in these contexts. However, individual differences, perhaps including approach and avoidance temperaments, seem likely to play a role in this process. However, because feedback on both tasks was always displayed in this study,

individuals may have maintained high levels of awareness of both competing goals throughout the 30-minute simulation. This awareness may have diminished another avenue of influence for individual differences and increased the tendency to balance performance on both tasks.

Although not hypothesized, a few individual difference effects were observed for cognitive ability, suggesting that the influence of individual differences may have been reduced on this task, but were not absent entirely. First, cognitive ability was positively related to the *total* number of schedules created combined across both tasks. Those with higher cognitive ability were able to create more schedules. Cognitive ability did *not* have a significant main effect on resource allocation. In other words, while cognitive ability was related to the total number of schedules created, it was not directly related to how individuals allocated the creation of these schedules across the two tasks. However, a modest interaction was found between cognitive ability and relative discrepancies. This interaction is displayed in Figure 10. Among individuals with high cognitive ability, the tendency to focus on the task with the largest discrepancy was slightly stronger than among those with low cognitive ability. This interaction effect did not differ across conditions or time. The most intuitive explanation for this interaction is that individuals with higher cognitive ability had greater confidence in their ability to meet the goal with the larger discrepancy and, therefore, focused their effort in that direction; in contrast, those with lower cognitive ability may have been less likely to believe the goal with the larger discrepancy could be attained and, as a result, were less likely to allocate their effort to that goal. In essence, the interaction of cognitive ability and relative discrepancies would be mediated by self-efficacy. However, the exploratory analyses

concerning the interactions of self-efficacy and relative discrepancies does not provide strong support for this explanation. Nonetheless, the role of cognitive ability in multiple-goal endeavors is an issue in need of greater attention.

Figure 10. Interaction of cognitive ability and relative perceived discrepancies.



Exploratory Findings

In addition to providing an empirical test of the formal hypothesizes, a secondary objective of this study was to examine additional processes that may be important in multiple goal self-regulation, but for which the current body of literature does not allow for firm hypotheses to be generated. A number of exploratory analyses involving self-efficacy and time were reported above, the implications of which will now be discussed in greater depth.

Self-efficacy effects in multiple-goal contexts. While self-efficacy is frequently thought to have positive effects on virtually all aspects of the self-regulatory process (e.g, Bandura & Cervone, 1986; Cervone, Jiwani, & Wood, 1991; Gist, 1987; Stevens & Gist,

1997), its role in multiple-goal self-regulation has not been well examined or understood. Depending upon the theory considered, one might predict that self-efficacy would be positively related to goal prioritization, or one might predict precisely the opposite. Expectancy-value theories postulate that the force to act in a given manner is determined by the multiplicative combination of expectancy and value. Thus, within a multiple goal context, expectancy-value theories would predict that individuals would tend to focus most heavily upon the task or goal for which they had the greatest efficacy, particularly when both tasks are equivalent in valance. In contrast, control theorists have argued that self-efficacy can lead individuals to underestimate the size of the discrepancy between performance and the goal, resulting in reduced allocation of resources such as time and effort (e.g., Powers, 1991; Vancouver et al., 2001). Extending this proposition to the multiple-goal context, this aspect of control theory suggests that individuals will tend to devote more time to the task with the lowest efficacy.

In the exploratory analyses conducted in this study, support was found for both of these perspectives, depending upon how it was examined. When focusing on the between-person relationships, higher self-efficacy was associated with greater allocation of resources. Thus, individuals who were more confident in their ability to perform a given task allocated more resources to that task than those with less confidence. Additionally, when examining *relative* discrepancy, the between person results suggest that individuals tend to focus on the task for which they had the most efficacy. This pattern of results is consistent with predictions derived from expectancy-value theories.

However, as Vancouver et al. (2001) have demonstrated within single-goal contexts, very different results can be seen when limiting one's focus to the within-person

effects of self-efficacy. When focusing on the within-person relationships, higher self-efficacy was associated with *lower* subsequent allocation of resources. Thus, when an individual has a high level of confidence in their ability to perform a particular task, they were likely to *reduce* the amount of resources subsequently allocated to that task. In multiple goal contexts, high levels of efficacy for one task may serve as a signal that the task is under control and in good standing and, thus, attention should be shifted towards the other task. Consistent with this pattern of results, the within-person analyses for *relative* discrepancies demonstrated that individuals tended to allocate more resources to the task for which they had the greatest efficacy. This pattern is consistent with recent control theory propositions concerning self-efficacy's within-person effects (e.g., Powers, 1991; Vancouver et al., 2001). However, whereas the prior work focused on single-goal endeavors, the current study extends these finding to multiple goal contexts.

These results demonstrate once again the need to clearly distinguish between- and within-person relationships, both conceptually and analytically. They also add further support for the notion that, when considering within-person relationships, high levels of self-efficacy may not necessarily be associated with greater resource allocation and performance. The role of self-efficacy in multiple goal contexts is clearly a very complex issue, one deserving of focused research attention. As will be discussed next, the role of both self-efficacy and discrepancies become even more complex when considering their relationships with resource allocation *over time*.

The role of time in goal prioritization. Time is an inherent aspect of self-regulatory theories (Karoly,1999). Self-regulatory theories often propose reciprocal relationships that unfold dynamically over time, with past and future states innately

linked. For example, past performance influences goal-performance discrepancies and self-efficacy, which then influence subsequent performance, and so on. Indeed, the explicit consideration of dynamic relationships of this nature is one of the hallmarks of this paradigm (e.g., Vancouver, 2000). However, while the processes examined within this paradigm unfold over time, the role of time itself is typically ignored. Yet, self-regulatory processes may not function in a consistent manner across all time points. Rather, the processes themselves may evolve, such that the influence of one construct on another changes in magnitude and/or direction over time. Thus, examining the role of time represents an important step towards developing more comprehensive and valuable theories of self-regulation.

Among the most interesting time-based exploratory analyses is the interaction of relative discrepancies and time. At early points during the simulation, participants tended to allocate additional resources to whichever task had the largest discrepancy at the time. This finding is consistent with the implications of control theory models of self-regulation (e.g., Carver & Scheier, 1996; Klien, 1989; Powers, 1973). However, as the simulation progressed, the strength of this tendency decreased. Finally, as the end of the available time neared, a reversal emerged, such that participants were most likely to allocate additional resources to whichever task had the *smallest* discrepancy. To the best of my knowledge, existing models of self-regulation do not readily predict such a reversal in the role of discrepancies over time.

A similar interaction was also found between relative self-efficacy and time. Early on, participants tended to focus on the task with the lowest efficacy. This may have been done in an effort to allocate time to where it was most needed. If one is confident in

their ability to attain the goal for one task, but less so for the other, focusing on the task with greatest efficacy may be seen as less essential for attaining that goal, whereas focusing on the task with lower efficacy is likely to be seen as a necessary step towards achieving that goal. Early in the simulation, participants may have felt that sufficient time remains to improve on the task with lower efficacy. However, as the end of the simulation drew near, the role of relative self-efficacy reversed, such that participants tended to focus upon the task for which they were *most* confident. With little time remaining to achieve the goals, participants may have concluded that there was not sufficient time remaining to improve on the task with relatively low efficacy to the point where its goal would be attainable. Further, they may have recognized that attempting to do so could result in neither goal being attained.

Given the similarity of the time interactions involving relative discrepancies and relative self-efficacy, as well as the strong theoretical and empirical links between self-efficacy and discrepancies, questions naturally arise concerning the uniqueness of each interaction. That is, one could question whether both interactions are reflections of the same underlying process. With limited research on multiple goal self-regulation, as well the limited consideration of the role of time in self-regulatory processes more generally, it is difficult to draw firm conclusions about the nature of the relationships among discrepancies, self-efficacy, and resource allocation over time. However, two possible models are identified in the following paragraphs.

One appealing possibility is that the evolving pattern of relationships between relative discrepancies and resource allocation over time is attributable to changes in self-efficacy. In other words, discrepancies and time may interact to influence self-efficacy

beliefs, which influence resource allocation. The logic of this model is as follows: One's belief that they can successfully reduce a discrepancy of a given size should decrease over time. For example, if there are currently 10 students in the ABC College line, one's efficacy for attaining the goal of "0" students in that line should be higher when 20 minutes remain in the simulation than when only 3 minutes remain. Thus, self-efficacy is influenced by both the size of the discrepancy and the time remaining to reduce it. Indeed, discrepancies and time did significantly interact in their relationship with self-efficacy, such that large discrepancies were more likely to be associated with low self-efficacy late in the simulation than early.

According to this model, individuals should be willing to devote resources to a goal with a large discrepancy when a large amount of time remains because they still believe the goal can be attained. However, when little time remains, individuals would be less willing to devote resources to a goal with a large discrepancy, as they would be less likely to believe that the goal could be attained in the limited remaining time. Again, this model suggests that discrepancies and time interact in their influences on self-efficacy, and self-efficacy in turn influences decisions about where to allocate resources. However, the results fail to provide empirical support for this notion, as the interaction between time and relative discrepancies remains even when controlling for any variation of self-efficacy (i.e. self-efficacy for referent task and/or self-efficacy for non-referent task, relative self-efficacy, centered or uncentered self-efficacy, etc).

Another possibility is that self-efficacy and discrepancies are each more relevant for prioritization at different stages of goal pursuit. At earlier points, self-efficacy may be less of a determining factor in prioritization decisions, as individuals may believe that

nearly any discrepancy can be overcome. As discussed above, the data in this study provide some empirical support for this notion, showing that the size of the discrepancy for a given task has little influence on one's efficacy for that task early in the simulation, but has large influences on efficacy late in the simulation. However, more critical to this proposed model is the belief concerning whether *both* goals can be attained. That is, when a large amount of time remains, individuals are less likely to conclude that they will only be able to meet one of the two goals, and that success on one task will have to be sacrificed for success on the other. Rather, they are likely to believe that both goals can be attained (and, thus, self-efficacy for both tasks should be high), regardless of the discrepancies on the two tasks. With most individuals believing that both goals can be attained, self-efficacy beliefs would have little influence on resource allocation. Instead, decisions about how to allocate resources to the two tasks is likely to be heavily influenced by discrepancies, with most individuals focusing on whichever task has the largest discrepancy at the time.

As time goes on and the deadline nears, the relative influence of self-efficacy and discrepancies may reverse. With little time remaining, many individuals may conclude that they will be unable to attain the goals for both tasks. Most of those who come to this decision would then likely choose to focus on whichever goal they felt they were most likely to achieve. Thus, at this point, the mediation model described above may come into play, with discrepancies exerting great influence on efficacy beliefs. These efficacy beliefs, in turn, may then be the deciding factor concerning where to allocate one's resources near the end of the simulation.

Unfortunately, testing the central aspects of the dual-process model is a likely to be a daunting challenge. Theoretically and empirically, discrepancies and efficacy are strongly and reciprocally linked. This covariance creates great difficulty when attempting to determine which of the two constructs has causal priority at any point in time, much less determining if or when changes in causal priority occur over time. Testing this and other models concerning the complex interplay of self-efficacy, discrepancies, and time in multiple-goal self-regulation is likely to require creative experimentation, directly influencing various aspects of the proposed processes to determine their precise roles over time. However challenging, the results of such endeavors are likely to be of great value for the further development and application of self-regulatory theories.

Limitations and Directions for Future Research

Throughout this discussion, a number of potential limitations of this study have been discussed, as have potential directions for future research. The purpose of this section is to summarize those limitations already discussed, address a few additional limitations not yet raised, and describe some potentially important and informative next steps for theoretical and empirical work on multiple-goal self-regulation that may provide a greater understanding of the phenomenon.

There are many characteristics of the task and goals utilized in this study that may influence the goal prioritization processes. One such characteristic discussed earlier is the provision of feedback continuously throughout the simulation. There are many tasks for which feedback is always available. However, on many other tasks, feedback may be less salient, available only occasionally, only when specifically requested, among many

other possibilities. As discussed above, these differences in feedback may have large and meaningful influences on self-regulatory processes in general, and multiple goal prioritization in particular. Thus, it is important from both a theoretical and practical perspective to develop an understanding of the influence of feedback on goal prioritization.

Another potentially important characteristic of the task utilized in this study is the temporal characteristics of goals provided. More specifically, the goals in this task had fixed deadlines (the end of the simulation) and could not be attained with certainty prior to the end of the simulation. Although one could achieve a level of performance consistent with the goal prior to the deadline, new students periodically joined the line, so reducing the line to 0 prior to the deadline was not a guarantee that there would still be no students in line at the end. Many real-world tasks have fixed timeframes for performance that cannot be altered – additionally, on many tasks performance is due not only to one's own behavior, but also to forces in the environment beyond the individuals control. Nonetheless, there are also many tasks that do not possess these characteristics. For some tasks, performance is due solely to the behaviors of the performer and is not significantly impacted by outside forces. Additionally, many tasks are terminal in nature, such that once the objective of that task has been accomplished, the task is complete and no further action is needed. These characteristics may have important influences on how individuals prioritize competing goals. When tasks are terminal in nature, individuals may be more inclined to work on the goals sequentially than was seen in this study. That is, they may prefer to get one goal "out of the way" before focusing on the other – doing so would guarantee that at least one goal is met before one focuses on other competing

goals. In contrast, when goals are ongoing and early attainment cannot be assured due to environmental influences, individuals may be more prone to alternate as a function of discrepancies, as was found in the current study. The influence of these characteristics remains purely speculative at this point, but presents an intriguing issue to be addressed by future research.

A related issue concerns the fact that the timeframes for both tasks was equivalent. Given the focus of this study, it was important to minimize differences between the two tasks, including the time available to meet the goals associated with the two tasks. However, future research should examine the influence of differential time frames for competing goals. The exploratory analyses involving time suggest, and common experience would concur, that oncoming deadlines can have powerful influences on the processes involved in goal prioritization. All else being equal, a goal with a rapidly approaching deadline is likely to be given greater priority than a goal whose deadline is far off in the future. Indeed, this would not be a surprising, or particularly interesting, finding. Yet, many interesting questions lurk just below the surface of this seemingly obvious effect. For example, do most individual's give priority to the goal with the greatest temporal urgency from the start, or only as the deadline nears? How close must the deadline be before temporal urgency is experienced? What individual differences are related to these processes? How do other characteristics of the goals, such as differences in value or importance, combine with temporal urgency to influence prioritization? Many other similar questions could be posed, all of which could provide rich and valuable information for self-regulatory theories. Additionally,

answering these questions could be of great practical use for helping individuals and organizations with time management problems.

Another issue to be considered is the role that learning plays in goal prioritization. Because learning was not of substantive interest in this study, practice trials were utilized to bring participants through the most substantial portions of the learning curve prior to beginning the main task. Given the current state of the literature of this topic, it was desirable to minimize the variance contributed by learning, which could potentially alter or mask the relationships under examination. However, the influence of learning on multiple goal self-regulation is an important topic that should be addressed in future research. It is possible that learning can reduce the conflict that is experienced between two goals. For example, by learning how to more quickly and efficiently execute the actions required to meet one or more of the competing goals, individuals may be able to more readily accomplish all of the goals in conflict, rather than having to sacrifice one to attain the other. Additionally, over time, individuals may be able to integrate initially conflicting goals into a single coherent activity. Examples of this type of integration are most easily seen among physical skills, such as driving a car with a manual transmission. Initially, it can be difficult to simultaneously execute all the actions required for this activity, such as steering, manipulating the clutch, and moving the shifter. Thus, novice drivers are required to rapidly switch attention between the various activities involved. However, with practice, these activities become integrated and automatized, such that they can be executed simultaneously with little or no conflict, and can even be executed while focusing much of one's attention on other activities that would initially be

conflicting as well. Indeed, many interesting and important questions remain concerning the influence of learning on goal conflict and prioritization.

In addition to the potential influence of learning on the processes involved in goal prioritization, it is also important to examine how individuals prioritize competing goals in learning contexts. Again, steps were taken to minimize the learning that occurred during the main trial in this study, making this primarily a performance rather than skill-acquisition task. However, it remains an open question whether the processes examined in this study function in a similar manner in learning contexts. Many learner-control training environments can be considered from a multiple-goal perspective, as individuals have multiple concepts and topics to learn and must make decisions about how to allocate their time to the various topics in the training program. Research on metacognition gives some indirect indications that individuals do allocate their time in a similar fashion to what was observed in this study. In the typical metamemory study,[6] participants are provided with a list of items to learn (ex, English-Swahili word pairs), are given some initial study time to learn these items, make judgments of how well they have learned each item in the list, and then often provided with additional time to study the items of their choice (e.g., Nelson & Narens, 1994). A common finding of this research is that participants allocate more of their time to the items that are least well known. Interestingly, Son and Metcalfe (2000) recently presented results that stand in contrast to this typical finding. They found that, when study time was more limited and participants were expecting a test, many participants spent more time on the items in which they felt

[6] Metamemory research is a specific subset of research on metacognition that focuses on individuals' beliefs about what they know, how they come to acquire these beliefs, and how they utilize these beliefs to guide subsequent learning. Metacognition research as a whole is a very broad in its scope and, thus, the descriptions of metamemory typical metamemory studies do not necessarily apply to other aspects of research on metacognition.

most confident, most likely in an attempt to assure that they could correctly recall those items. Regardless, it is clear that there is a great deal to learn about how individuals allocate study time to various topics within learner control training, and the implications of those decisions for learning and performance.

Yet another interesting direction for future research is to more explicitly compare the functioning of important aspects of the regulatory process in single- and dual-goal contexts. In the current study, two conditions provided participants with a superordinate goal for only one of the two tasks which, as expected, led participants to focus predominately on the task with the superordinate goal. Thus, these two conditions *approximate* single-goal contexts in many respects. However, true single-goal studies, as typically used in motivation research, present only a single task and single goal for participants to work towards. Thus, rather than focusing *predominately* on one task, as in the single-superordinate-goal conditions in this study, participants in typical motivation studies focus *exclusively* on only one task. This difference may have very important implications for many goal related phenomena. As one example, individuals are likely to demonstrate greater persistence on difficult (or even impossible) goals when there are no other legitimate task goals to be pursued. However, when multiple goals are available to pursue, those experiencing difficulty meeting one goal may shift their attention to other goals, perhaps even if those goals are of less importance. By more explicitly contrasting single- and multiple-goal contexts, a better understanding of important regulatory processes can be gained.

Implications and Conclusions

Although little explicit consideration has been given to goal prioritization in existing theories of self-regulation, many of the findings of this study are largely consistent with the implications of control theory models of self-regulation (e.g., Carver & Scheier, 1996; Klien, 1989; Powers, 1973). For example, Power's (1973) argued that when one conflicting control system experiences greater error than its counterpart, the system experiencing lower error reduces its output while the system experiencing greater error increases output, thus lending greater priority to the system experiencing the greatest amount of error. Likewise, Klein (1989) proposed that, when conflicting goals are of equal importance, individuals tend to focus on the goal with the largest discrepancy. Despite these assertions, very little empirical research has examined the validity of these propositions. Thus, one contribution of this study is in providing empirical support the limited propositions that have emerged from control theory concerning multiple-goal prioritization.

This study also lent support to another fundamental aspect of self-regulatory theories – the power of superordinate goals. While many theories, such as control theory, devote a great deal of attention to the hierarchical structure of goals and the influence of superordinate goals on their subgoals, this is the first known study to explicitly consider the impact of superordinate goals on the prioritization of multiple competing goals. Indeed, superordinate goals were highly influential in determining goal prioritization over time. Additionally, this study integrated a diverse body of literature on approach and avoidance. It was shown that the approach or avoidance framing of superordinate goals can lead to differences in prioritization among subgoals. In the past decade or so, there

has been considerable integration of approach and avoidance concepts into theories of self-regulation. These results provide additional support for the merits of this integration and suggest that further efforts in this direction are likely to further benefit our understanding of self-regulatory processes.

As this study represents but one step towards understanding goal prioritization, the practical implications of this study in and of itself are largely indirect and tentative. However, by contributing toward the development of a larger body of research, this study may ultimately lead towards numerous applications for practice. One of the more direct implications of this study concerns the influence of superordinate goals on prioritization. The results demonstrated that, when a superordinate goal was presented for only one of the two tasks, participants focused predominately on the task with the superordinate goal, and were considerably more successful at attaining the goal for that task, as compared to the alternative task. This suggests that linking the attainment of important organizational goals to other important internal or external goals is likely to lead to greater effort and success on those goals. Of course, this conclusion is not new, as it is a central tenet of VIE theory (Vroom, 1964), as well as many other theories of motivation (e.g., Naylor, Pritchard, & Ilgen, 1980), but this study provides further support for this proposition from the perspective of goal prioritization.

Additionally, this study shows that the framing of superordinate goals is important to consider, particularly when superordinate goals are provided for multiple competing goals. When one task had an approach-framed superordinate goal whereas the other had an avoidance-framed superordinate goal, participants gave higher priority to the task with the avoidance frame. Additionally, only discrepancies for the avoidance-

framed task were found to predict resource allocation – discrepancies for the approach-framed task did not have a significant influence. Thus, participants were most likely to focus on the approach-framed task because they were doing relatively well on the avoidance task – and presumably they could afford to shift focus away from that task – not necessarily because they were doing poorly on the approach framed task and needed to give it extra attention. This suggests that individuals give greater priority to activities that will avoid losses than activities that will result in gains. From this finding, one might infer that it would be most beneficial to attach avoidance superordinate goals to important organizational tasks – for example, penalizing poor performance rather than rewarding high performance. These results suggest that, at least in the short term, this may result in higher priority being given to activities associated with the avoidance superordinate goal. However, the long-term effects of such a strategy are unclear. Because the pursuit of avoidance goals tend to engender anxiety (e.g., Carver & Scheier, 1998; Higgins, 1997), the long-term effects of avoidance superordinate goals may be detrimental, not only to performance, but to employee well-being.

Other practical implications may accrue as the body of literature on this topic is further developed. In particular, developments in our understanding of multiple-goal processes may be of great utility for team-based training and performance. In many team-based work structures, team members must learn and perform their own unique tasks and responsibilities, as well as those tasks that are integral to the performance of the team as a whole. This requires prioritization of the various aspects of performance, frequent shifting of attention from individual to team tasks and back again. By developing a sound body of knowledge on how individuals prioritize competing goals, it

may be possible to assist team members in more effectively prioritizing among individual and team responsibilities during critical and potentially high-stress operations.

In addition, a broad and refined theoretical and empirical base concerning multiple-goal self-regulation may provide valuable insights for learner-control training. As mentioned above, learner-control training programs present the learners with the problem of determining where to allocate their time and attention at various points during the training. By understanding how individuals prioritize among multiple goals competing for one's time, and extending this knowledge to learning contexts, we may be able to help learners make better choices about how to direct their own learning, ultimately leading to greater benefits from learner-control training. A related issue is understanding how individuals balance the demands of engaging in self-directed training programs and the demands of their primary work responsibilities. Employees are often encouraged to take advantage of web-based, self-directed training programs that many organizations make available, but must still often perform their normal daily responsibilities. Prioritizing among these competing demands on one's time is a difficult challenge, and better understanding how individuals cope with multiple competing goals more generally may provide valuable information concerning specific conflicts, such as that between training and performance.

This study provides an important, but narrow glimpse into the issues involved in multiple-goal self-regulation and the prioritization of competing goals. Despite the substantial contributions of this study, much work remains to be done to understand this complex issue. It is my hope that this study will help to inform and stimulate additional research in this area.

APPENDICES

APPENDICES

Informed Consent Form for "Multitasking study"

Explanation of Research:
This study is intended to examine how individuals make decisions about where to allocate their time and attention when performing a multi-tasking simulation.

Procedures and Estimate of Time:
In this study, you will perform a computerized "class scheduling" task. In this task, you will create fictitious class schedules for two groups of students at a fictitious university. Before beginning the simulation, you will first answer a brief series of questionnaires. The study is expected to take 1 hours 35 minutes - thus, you will receive 4 psychology research credits for your participation in this study.

Participation:
Participation in this study is voluntary. You may choose not to participate in some or all parts of the study. You may discontinue the experiment at any time without loss of your research participation credits.

Confidentiality:
Your privacy will be protected to the maximum extent allowable by law. Data gathered from you during this study will be strictly confidential. Your responses will remain anonymous in any research reports. At your request, the result will be made available to you.

Risks and Costs:
There are no risks or costs associated with your participation

Investigators (direct any questions regarding this research here):
Richard P. DeShon, deshon@msu.edu, 353-4624; Aaron M. Schmidt, schmi164@msu.edu, 432-7069.

University Committee on Research Involving Human Subjects (direct any questions regarding being a human subject of research here): Ashir Kumar, MD, Chair; 202 Olds Hall, Michigan State University; East Lansing, MI 48824-1046; PHONE (517) 355-2180; FAX (517) 432-4503; E-Mail - UCRIHS@msu.edu

If you have questions about your participation in this study, please ask the investigator now.

The procedures and possible risks of the experiment have been explained. Do you fully consent to participate in the study described above?

☐ Yes ☐ No

If you makred "Yes," please enter the information requested below:

Name (print):_____ **Date**:_____

Signiture: _____

Debriefing

The study in which you just participated was designed to examine how people perform in complex multi-tasking situations. Many current work environments require employees to perform multiple tasks at the same time, requiring them to shift attention back and forth between tasks. The goal of this study is to better understand how individuals perform these complex tasks.

When pursuing multiple task goals within the same limited amount of time, individuals are forced to make difficult choices about how to split their time and attention between the two goals. In the study you just participated, the challenge was splitting attention between creating courses for "ABC College" students and "XYZ College" students.

By focusing primarily on one goal and ignoring the other, one has a better chance of meeting that goal – however, using this strategy means that there is little hope of attaining the goal that is ignored. Focusing on both goals provides one with the opportunity to meeting each goal – however, because of the complexity of the task, a great deal of effort is needed to perform at the level needed meet both goals. By attempting to meet both, one runs the risk of meeting neither. This study is interested in examining how individuals make these difficult decisions on complex tasks such as this.

This study is also interested in how individuals' personalities influence the strategies that individuals employ on this task. Some individuals prefer alternatives that lead to a more certain payoff, even if this means missing the opportunity for a larger payoff – these individuals prefer to "play it safe." Other individuals prefer alternatives that lead to the maximum payoff, even if these alternatives have a greater risk of receiving nothing – these individuals prefer to have "all or nothing." This study is interested in examining how such differences in individuals' personalities influence choices made in this complex multi-tasking situation.

Please DO NOT discuss any aspect of this study with anyone who may participate in the study in the future (i.e. in the next few weeks). If participants come into the study with prior knowledge of any aspect of the study, it will likely alter the way they approach the study and, as a result, invalidate the results of this study. Therefore, I again ask that you please NOT discuss any aspect of this study with anyone who may participate in the study in the future.

I am very grateful for your participation in this study. If you have any questions about this study or would like to receive a copy of the results when they are complete, please notify the investigator now, by phone at 353-2171, or by e-mail at schmi164@msu.edu.

Thank you again for participating in this study,
Aaron Schmidt

Appendix B

Extraversion and Neuroticism

Instructions: On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options

1: Very Inaccurate
2: Moderately Inaccurate
3: Neither Inaccurate nor Accurate
4: Moderately Accurate
5: Very Accurate

[Extraversion]

1. I am the life of the party.
2. I feel comfortable around people.
3. I start conversations.
4. I talk to a lot of different people at parties.
5. I don't mind being the center of attention.
6. I don't talk a lot.
7. I keep in the background.
8. I have little to say.
9. I don't like to draw attention to myself.
10. I Am quiet around strangers.

[Neuroticism]

11. I Am relaxed most of the time.
12. I Seldom feel blue.
13. I get stressed out easily.
14. I worry about things.
15. I am easily disturbed.
16. I get upset easily.
17. I change my mood a lot.
18. I have frequent mood swings.
19. I get irritated easily.
20. I often feel blue.

Appendix B

Behavioral Inhibition System (BIS)/Behavioral Activation System (BAS)

Instructions: Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to all the items; do not leave any blank. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

1	2	3	4	5
strongly disagree	disagree	neutral	agree	strongly agree

1. A person's family is the most important thing in life.
2. Even if something bad is about to happen to me, I rarely experience fear or nervousness.
3. I go out of my way to get things I want.
4. When I'm doing well at something I love to keep at it.
5. I'm always willing to try something new if I think it will be fun.
6. How I dress is important to me.
7. When I get something I want, I feel excited and energized.
8. Criticism or scolding hurts me quite a bit.
9. When I want something I usually go all-out to get it.
10. I will often do things for no other reason than that they might be fun.
11. It's hard for me to find the time to do things such as get a haircut.
12. If I see a chance to get something I want I move on it right away.
13. I feel pretty worried or upset when I think or know somebody is angry at me.
14. When I see an opportunity for something I like I get excited right away.
15. I often act on the spur of the moment.
16. If I think something unpleasant is going to happen I usually get pretty "worked up."
17. I often wonder why people act the way they do.
18. When good things happen to me, it affects me strongly.
19. I feel worried when I think I have done poorly at something important.
20. I crave excitement and new sensations.
21. When I go after something I use a "no holds barred" approach.
22. I have very few fears compared to my friends.
23. It would excite me to win a contest.
24. I worry about making mistakes.

Appendix B

PANAS

Instructions: This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you ***generally*** feel this way, that is, how you feel on average. Use the following scale to make your ratings:

For each statement, select the response that best represents your opinion:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1. interested
2. distressed
3. excited
4. upset
5. strong
6. guilty
7. scared
8. hostile
9. enthusiastic
10. proud
11. irritable
12. alert
13. ashamed
14. inspired
15. nervous
16. determined
17. attentive
18. jittery
19. active
20. afraid

Appendix C

Initial Task Instructions

Task Introduction (page 1 of 11)

In this task, you will be asked to assume the role of an academic advisor at a major university. As an academic advisor, your job is to create class schedules for university students. Thus, your duty in this study is to create as many non-redundant class schedules as possible.

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Task Introduction (page 2 of 11)

You will create class schedules using a computer interface that will be described in detail momentarily. In brief, a list of available classes will be presented on the right half of the computer screen. Schedules are created by selecting classes from this list. In completing these schedules, you must use the following rules:

1. each schedule must have 4 different classes scheduled;
2. each class must be scheduled for the same day;
3. class times cannot overlap;
4. each schedule must be unique; it cannot duplicate another schedule;
5. any course with a quiz or lab section must have the quiz or lab scheduled as well; likewise, quiz or lab sections cannot be scheduled without the corresponding lecture class;
6. no two marketing courses (i.e. consumer behavior, marketing strategy, and marketing research) can be scheduled within one hour of each other;

In the next few pages of this introduction, we'll give you a look at the computer interface that you will be using to create schedules. We'll also walk you through the steps involved in creating and submiting class schedules. During this walk-through, we'll go over each of the rules listed above in greater detail and show you examples of schedules that DO and DO NOT follow these rules. You will then have a few minutes to practice creating schedules before being placed "on the job" to begin your work as an academic advisor.

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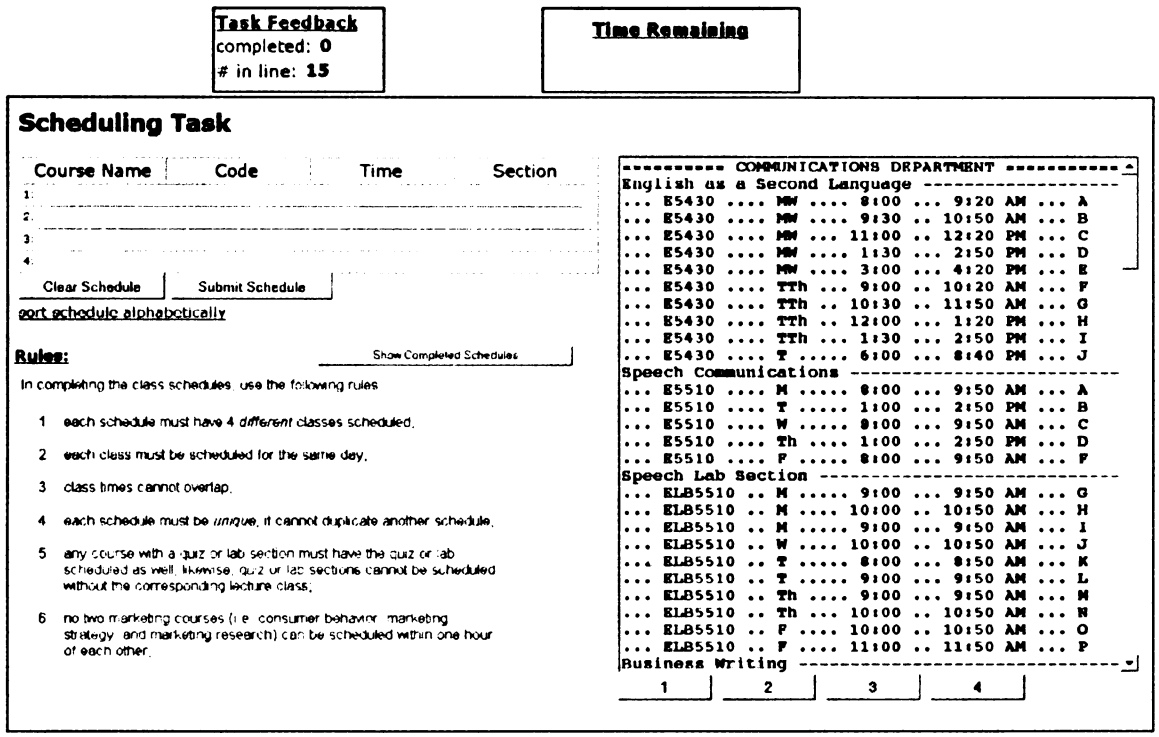
Task Introduction: First Look at the Computer Interface (page 3 of 11)

Below is a picture of the computer interface. On the following pages, we will discuss the various aspects of this interface:



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Task Introduction: Four Components of the Scheduling Interface (page 4 of 11)

As illustrated in the image below, there are four major components of the scheduling interface:

1. the classes selected for the current schedule
2. a list of available the classes selected for the current schedule
3. the rules that all schedules must conform to -- this area can also display a list of all schedules that have previously been created
4. feedback concerning the number of schedules that have been created, as well as the time remaining in the simulation

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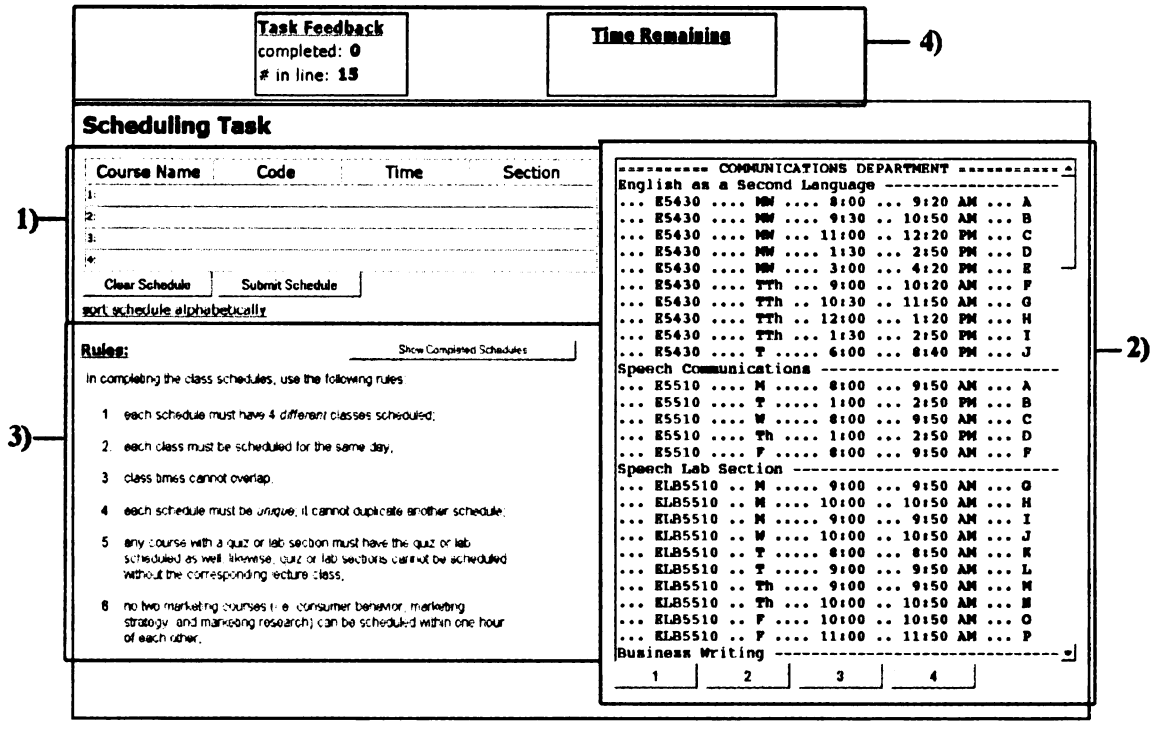

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Task Introduction: Creating Schedules (page 5 of 11)

We will now walk through the steps involved in creating a schedule. The first step is to scroll through the list of available courses (labelled '2' in the image below) to find the course and section that you wish to add to the current schedule. Select the desired course by clicking on it with the mouse -- the selected course will have a blue background, as illustrated below. Then, click one of the numbered buttons below the list of classes to add the course to the corresponding slot in the current schedule (the current schedule is labeled '1' in the image below).

For example, to add a course to slot 1 of the current schedule, select a course and then click the button labelled '1', as illustrated below. The same procedure is followed to fill in the remaining slots in the current schedule.

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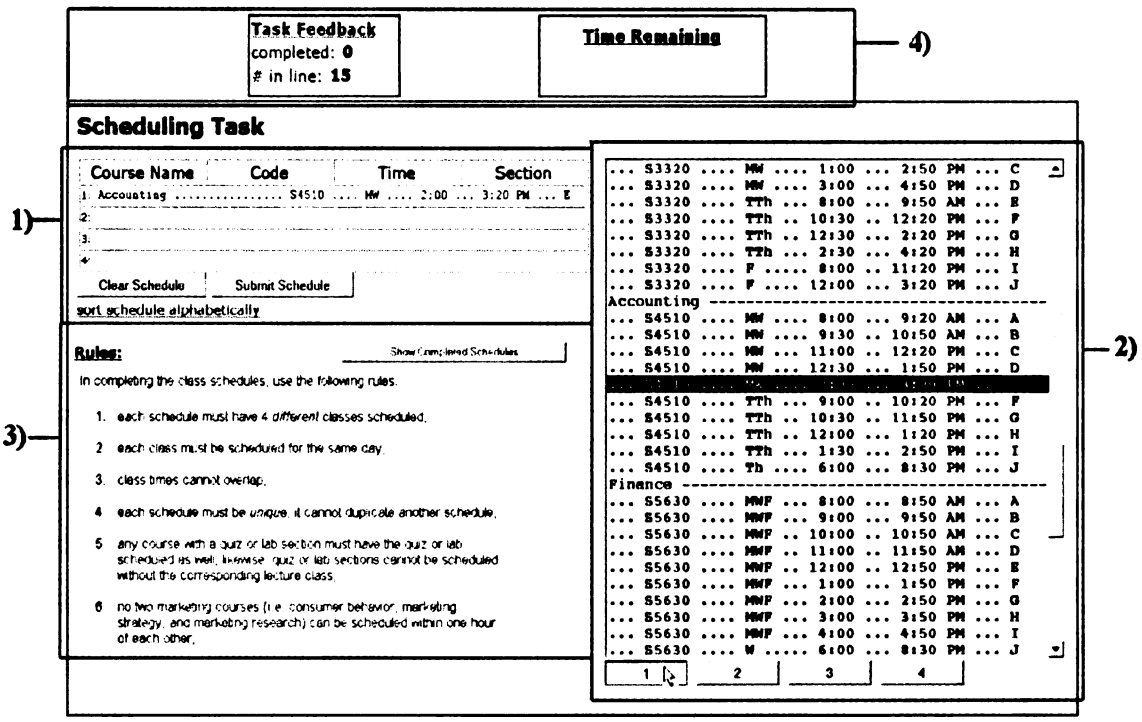

If you decide you want to change one or more of the courses that have already been added to the *current* schedule, you can do this in two different ways. First, you can simply select a new course and click the button associated with the slot in the current schedule that you want to replace. For example, if you want to change the course that has been added to slot '1', simply select another course and click the '1' button below the list of courses.

A second way to change the courses is by clicking the "Clear Schedule" button below the current schedule. Clicking this button will remove all the courses in the current schedule.

Note: courses CANNOT be changed on schedules that have already been submitted.

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Task Introduction: Submiting Schedules (page 6 of 11)

Once four classes have been added to the current schedule, you can submit it by clicking the "Submit Schedule" button directly below the current schedule (box 1 in the illustration below). Although you can attempt to submit a schedule at any time, the schedule must conform to the rules specified in box 3 in the illustration below. Specifically:

1. each schedule must have 4 different classes scheduled;
2. each class must be scheduled for the same day;

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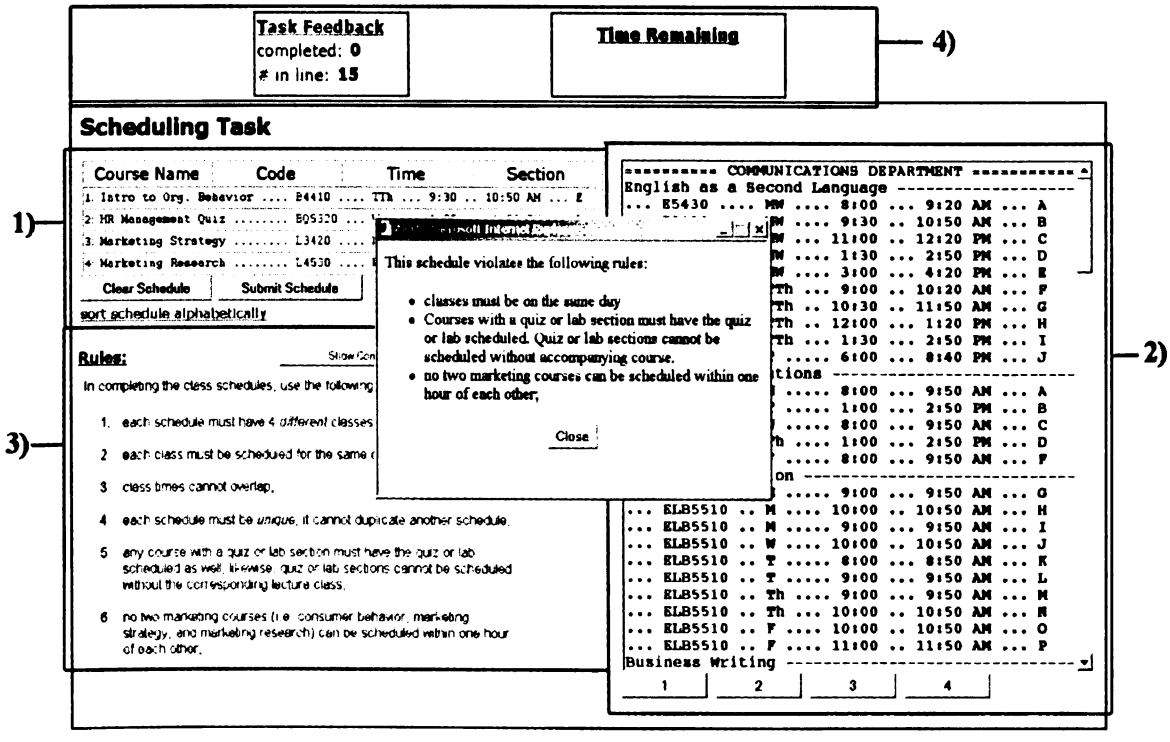
3. class times cannot overlap;
4. each schedule must be unique; it cannot duplicate another schedule;
5. any course with a quiz or lab section must have the quiz or lab scheduled as well; likewise, quiz or lab sections cannot be scheduled without the corresponding lecture class;
6. no two marketing courses (i.e. consumer behavior, marketing strategy, and marketing research) can be scheduled within one hour of each other;

If the current schedule violates one or more of these rules when the "Submit Schedule" button is clicked, a window will appear to inform you of the rule or rules that have been violated. The schedule will not be submited and will remain on the screen. You can revise the schedule by changing one or more of the courses, or click "Clear Schedule" to erase all courses in the current schedule and start over on that schedule.

In the example illustrated below, an attempt has been made to submit a schedule that violates several of the rules. An error message has appeared reporting the specific rules that the current schedule violates.



In a few moments, we will talk a little more about the rules and show you examples of schedules correct schedules, as well as examples of schedules that violate task rules.

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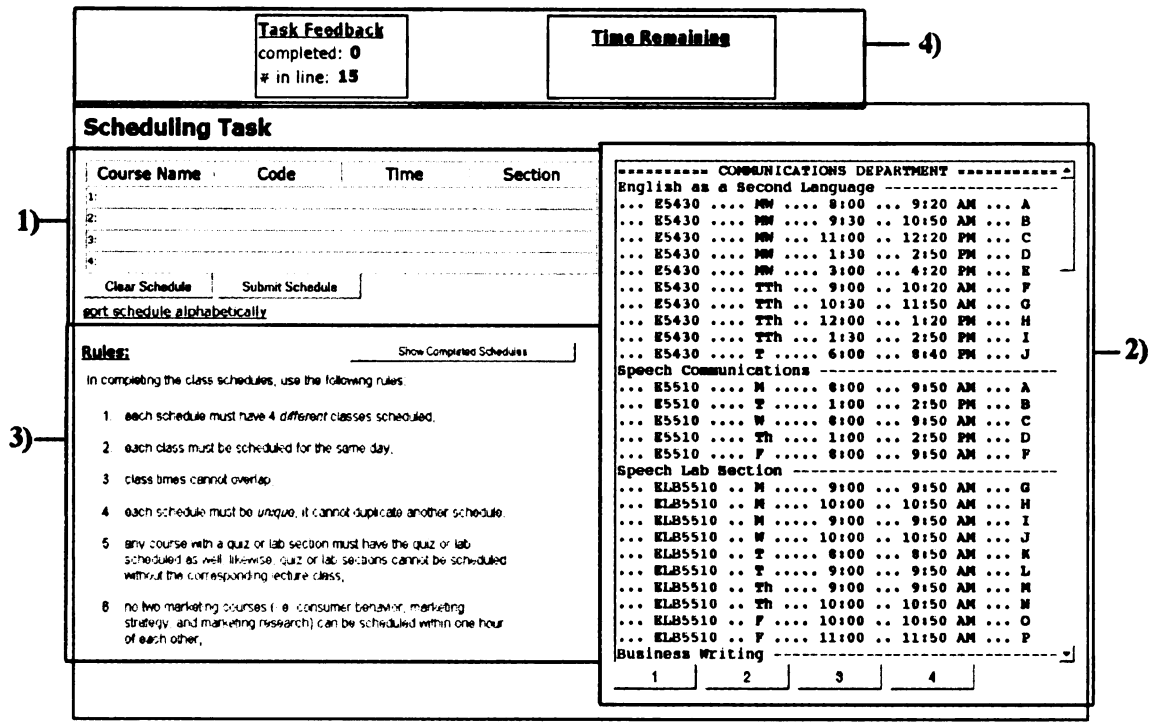
Task Introduction: Feedback (page 7 of 11)

The box labeled '4' in the image below provides feedback on the class scheduling task. More specifically, "# in line" tells you how many students are currently waiting in line for you to create their schedules. Your basic objective is to keep this line as short as possible by creating schedules as quickly and accurately as you can. Each time you sucessfully submit a schedule, the number of students in line is reduced by 1.



Also at the top of the screen, next to the feedback box, is a timer. This counts down the time remaining in the task, so you will always know how much time remains for you to create schedules.

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Task Introduction: Feedback (page 8 of 11)

It is important to keep in mind that the number of schedules that you create is not the only thing that determines how many students are in line. Just like in the real world, on this task additional students will periodically join the line. And, just like the real world, on this task it is difficult to know exactly when more students will join the

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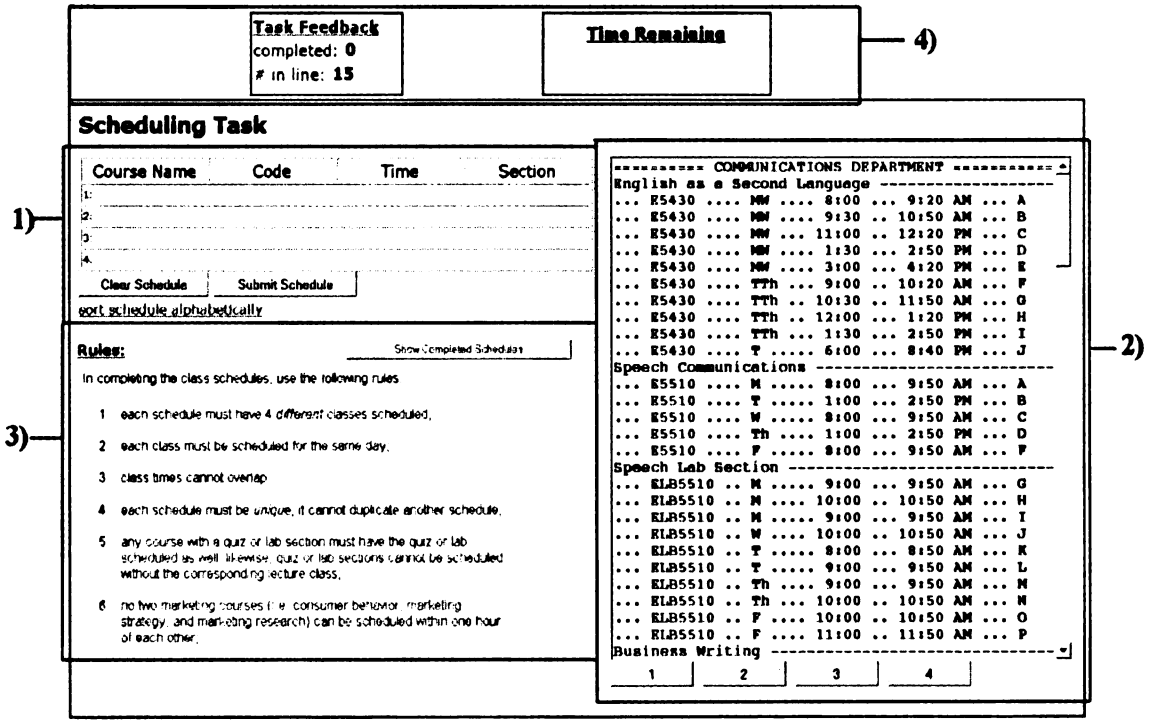
line, or how many students will join the line at any time. So, you will need to stay on top of things to reduce the size of the line despite the periodic addition of new students into the line!

When more students enter the line, the background of the window will blink several times, alternating between white and tan. This provides you with instant notification of the fact that more students have entered the line.

It is important to note that it **IS** possible to create more schedules even when there are no students in line. By continuing to create schedules even when there are no students in line, you can create a surplus of schedules so that, when more students enter the line, you already have schedules prepared for them and they do not have to wait to receive their schedule. When you create a surplus of schedules, the "# in line" will be a negative value, indicating how many surplus schedules you have created. For example, if there are no more students in line, and you create 3 more schedules, the "# in line" will be -3. If a student then enters the line, they immediately receive one of the surplus schedules, "# in line" will be -2, indicating that you have two surplus schedules.



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Appendix C

Task Introduction: Example of Correct Schedule (page 9 of 11)

This page shows an example of a correct schedule:

Course Name	Code	Time	Section
1: Business Writing	E5620	MWF ... 9:00	... 9:50 AM ... B
2: Intro to Org. Behavior	B4410	MW ... 10:30	.. 11:50 AM ... B
3: Org. Behavior Quiz	BQ4410	M 1:00	... 1:50 PM ... L
4: Consumer Behavior	L2210	MW 2:00	... 3:20 PM ... E

This schedule meets all 6 rules. Specifically:

1. the schedule has 4 different classes scheduled;
2. each class is scheduled for the same day. Note that, as this example shows, classes do NOT have to overlap on ALL days. However, at least one day of the week must be common to all classes in the schedule. In this example, it is not necessary that each class be scheduled on MWF, or each class be scheduled on MW, and so on. However, this schedule is valid because all 4 of the classes are held on Monday. The fact that some of the classes are also held on additional days does not invalidate the schedule.
3. the class times do not overlap;
4. although this is the only schedule that has been created so far, we will assume that it is unique and does not duplicate another schedule that you have already created;
5. "Intro to Org. Behavior" has a quiz section, and the quiz section has been scheduled as well. If the quiz section was NOT scheduled, or if the quiz section was scheduled WITHOUT the the lecture section, the schedule would be invalid. None of the other courses in this schedule have a quiz or lab section that must be scheduled.
6. only one marketing course is scheduled (consumer behavior), so the schedule does not violate the rule stating that no two marketing courses (i.e. consumer behavior, marketing strategy, and marketing research) can be scheduled within one hour of each other;

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Appendix C

Task Introduction: Example of Incorrect Schedule (page 10 of 11)

This page shows an example of an incorrect schedule:

Course Name	Code	Time	Section
1: Business Writing	E5620	MWF ... 9:00 ...	9:50 AM ... B
2: Intro to Org. Behavior	B4410	MW ... 10:30 ..	11:50 AM ... B
3: Org. Behavior Quiz	BQ4410 ...	M ..... 1:00 ...	1:50 PM ... L
4: Consumer Behavior	L2210	MW .... 2:00 ...	3:20 PM ... E

This schedule is incorrect in the following ways:

- each class is NOT scheduled for the same day. "Consumer Behavior" and "Marketing Strategy" are both held on TTh (Tuesday and Thursday), but neither of the other two courses is held on either T (Tuesday) or Th (Thursday);
- the class times for "Org. Behavior Quiz" and "Intro to HR Management" overlap;
- "Intro to HR Management" has a quiz section, but the quiz section has not been scheduled. Also, "Org. Behavior Quiz" has been scheduled without the associated lecture section;
- two marketing courses ("Consumer Behavior" and "Marketing Strategy") are scheduled within one hour of each other;

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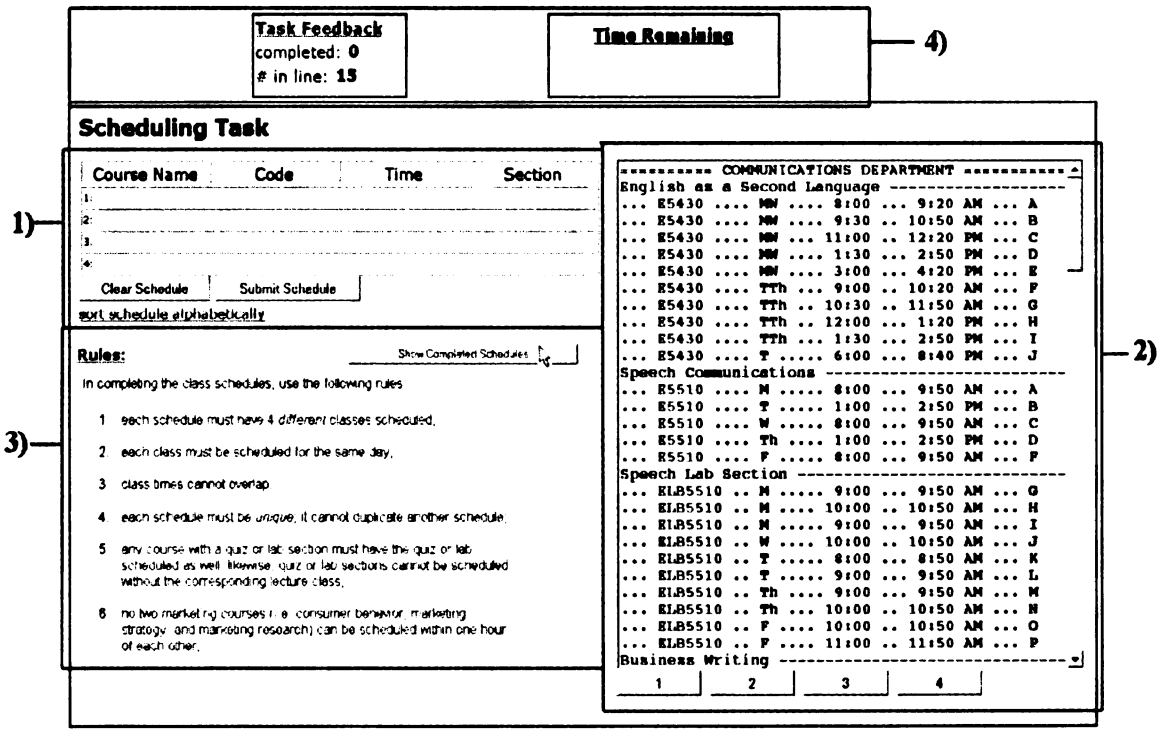
Task Introduction: Viewing Previously Created Schedules (page 10 of 11)

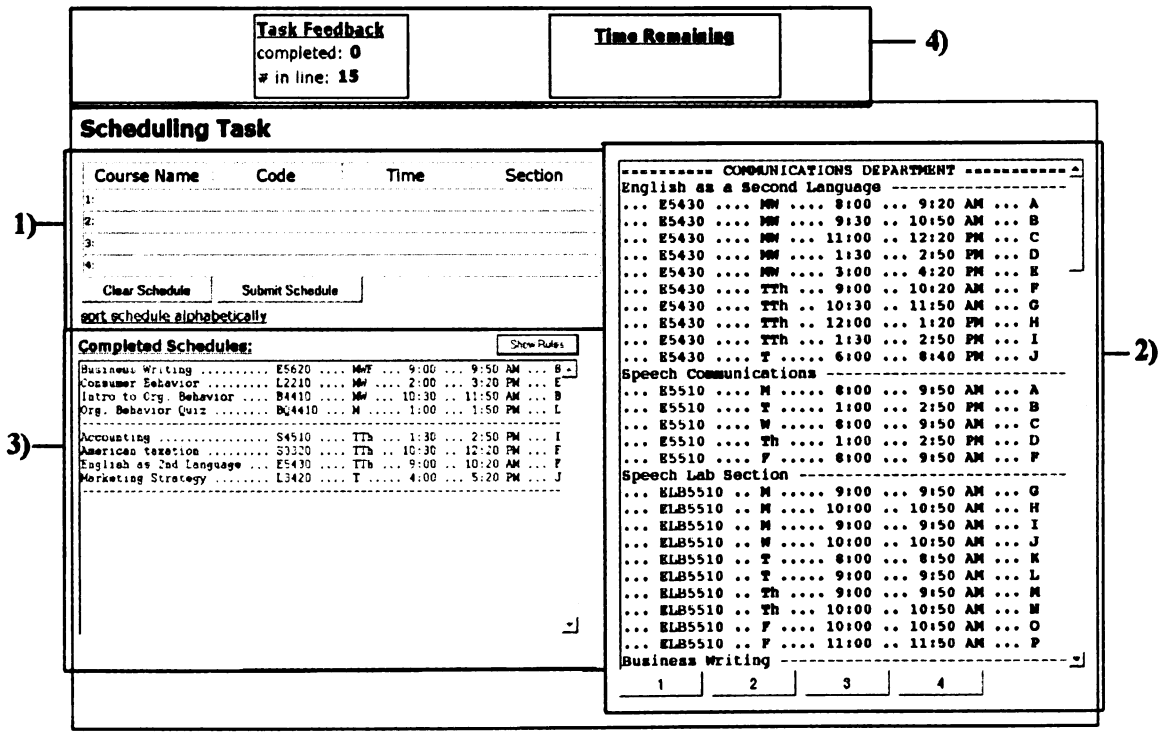
As discussed earlier, in order for a schedule to be valid, it must be unique -- it cannot duplicate a schedule that you have already created. There are two tools in the class-scheduling computer interface that can help you determine if this rule is being met by the current schedule.

First, you can view a list of all the schedules you have already created by clicking on the "Show Completed Schedules" button above the list of rules, as illustrated below.

Appendix C



When you click the "Show Completed Schedules" button, the area of the screen that displays the rules changes, so that it now displays a list of all the schedules you have created so far. This is displayed below:



The schedules are displayed in the order they were created, and are separated by a dashed-line.

Appendix C

While the schedules are presented in the order that they were created the classes that make up each schedule are not necessarily listed in the order that they were listed when you created the schedule. Instead, the classes for each schedule are listed in alphabetical order. To help you to determine if the current schedule to the previously created schedules, you can sort the current schedule alphabetically by clicking the "sort schedule alphabetically" link below the current schedule.

You can return to viewing the rules by clicking on the "Show Rules" button above the list of completed schedules.

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Task Introduction: Hands-On Experience (page 11 of 11)

Now that you've read a little about how to perform the class scheduling task, it's time to get some hands-on experience! You will have 4 minutes to perform the task, experiment with the various features of the task interface, and generally become comfortable with the task before being placed "on the job."

Click HERE to begin the practice trial

Appendix D

Instructions for Dual-Task Interface

Task Introduction (page 1 of 6)

Now that you have had a chance to have some hands-on experience with the class scheduling task, its almost time to begin performing the task "on the job."

Your duties as an academic advisor are a little more complicated than we have discussed so far. Up to now, you have performed the task for a single group of students. You did not have to be concerned with who the students were or which college within the university they were associated with. You simply created as many schedules as you could.

However, when you begin your work as an academic advisor in a few moments, you will be asked to create schedules for two seperate groups of students. You will be asked to create schedules for students from **ABC College**, as well as students from **XYZ College**. Rather than there being a single line of students waiting for you two create their schedules, there will be two separate lines of students, one line for ABC College students, and a second line for XYZ College students. Your basic objective is to keep both lines as short as possible by creating schedules for the two groups of students.

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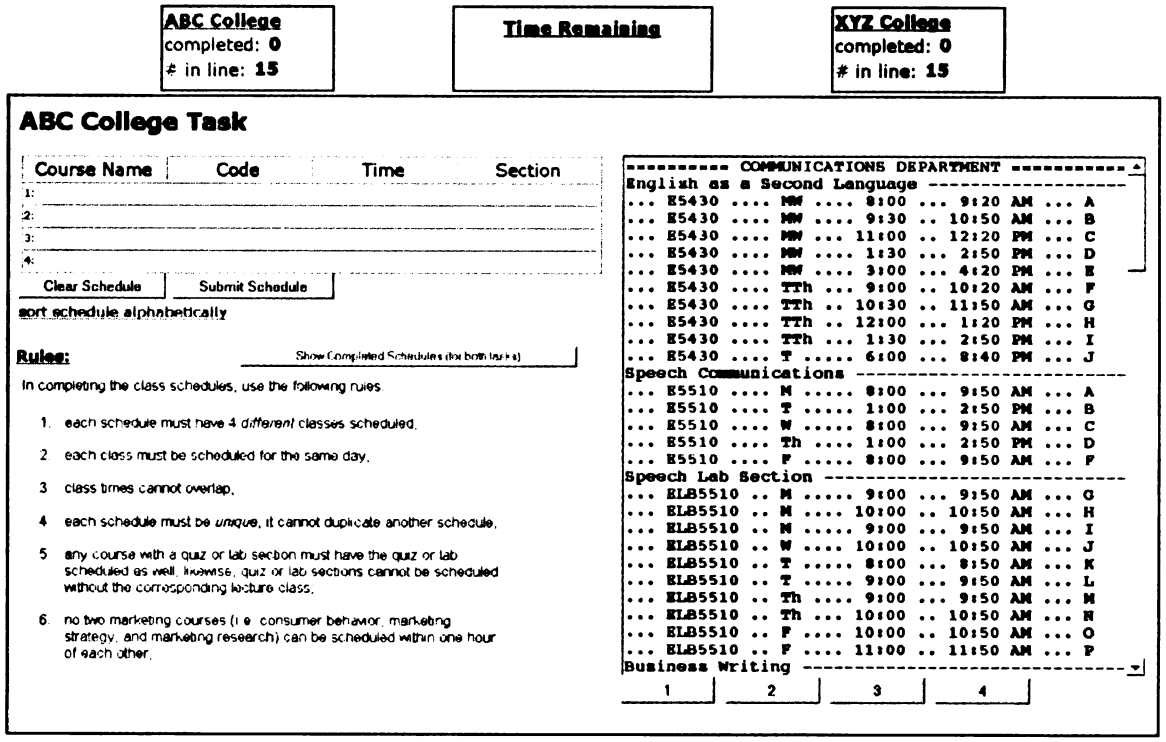
Task Introduction (page 2 of 6)

Below is a picture of the computer interface for creating schedules for ABC College and XYZ College students. The components of this computer interface are the same as those described earlier, with one important difference. Rather than one box displaying the number of students in line waiting for their schedules to be created, there are two such boxes: one indicating the number of ABC College students in line, and one indicating the number of XYZ College students in line.

Appendix D



New students will periodically enter the two lines. When students enter the ABC College line, the background of the window will blink several times, alternating between **tan** and white. When students enter the XYZ College line, the background of the window will blink several times, alternating between **grey** and white. So, when the background blinks, you know that additional students have entered one of the two lines. The color of the blinking background tells you which of the two lines the students have entered.

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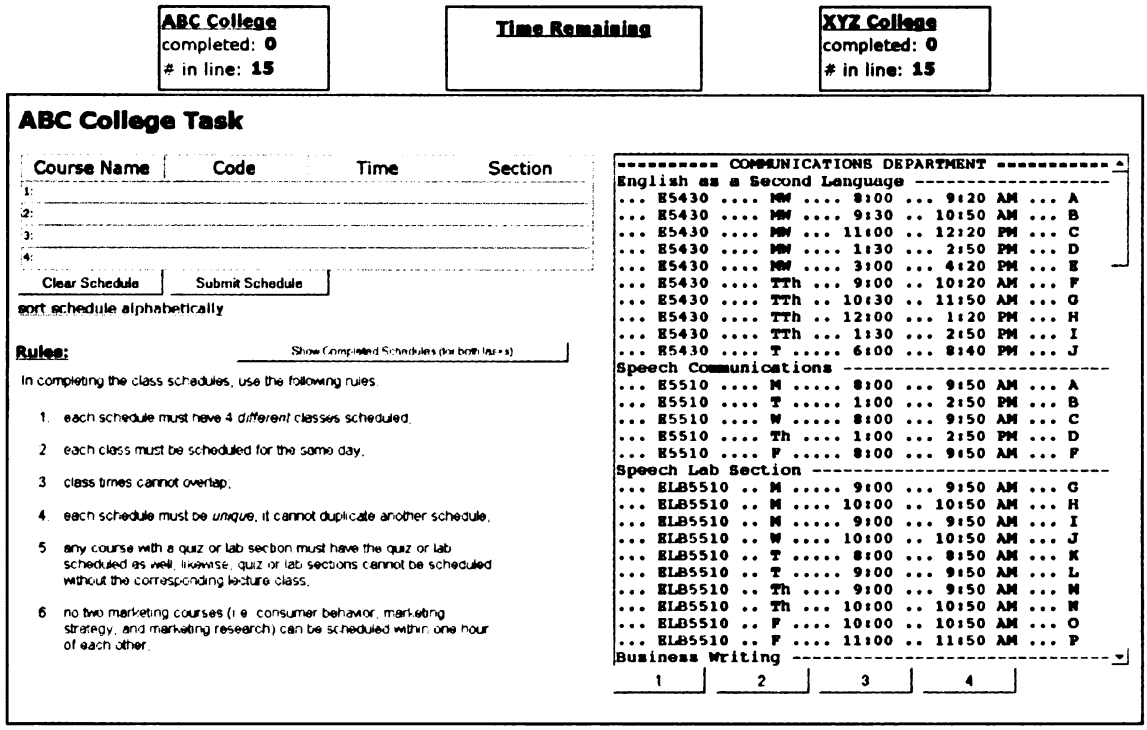
Task Introduction (page 3 of 6)

On this page, we will describe how to create schedules for the two different sets of students. The steps involved in creating the schedules themselves are identical to what was described and practiced earlier. However, an additional step is required to determine which of the two sets of students one is creating schedules for at any given time.

To create a schedule for a particular group of students, you must first activate the scheduling interface for the group of students in question by clicking anywhere within the feedback box associated with that group. When you do so, the name of the active scheduling interface will appear above the current schedule. Additionally, the feedback box for the selected group will be highlighted. Once the desired scheduling interface has been selected, you then simply follow the procedures that were described earlier to create a schedule for that group of students. The image below shows what the screen would look like if the ABC College interface was active:

Appendix D



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Task Introduction (page 4 of 6)

We'll now walk go through an example to make this more concrete. Lets assume that you want to create a schedule for XYZ College. If the XYZ College interface is already active, you can proceed to create the schedule. If the ABC College interface is active, as in the image below, you must first switch interfaces by clicking on the XYZ College feedback box at the top of the screen.

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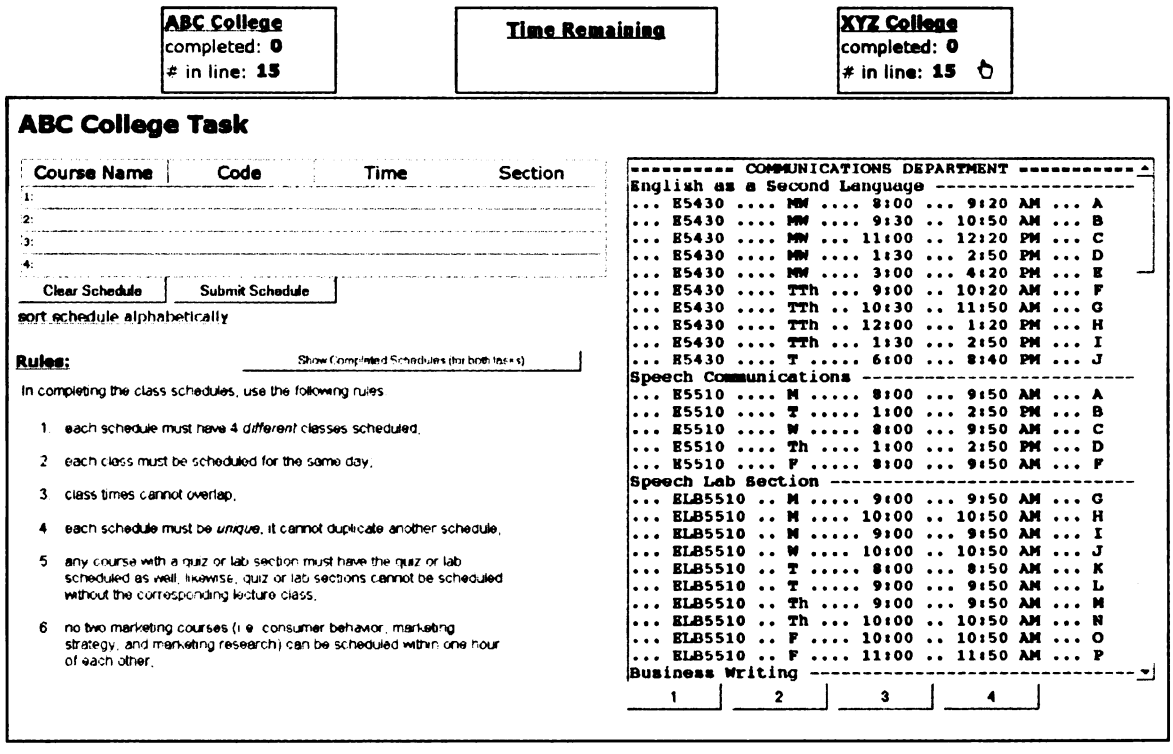
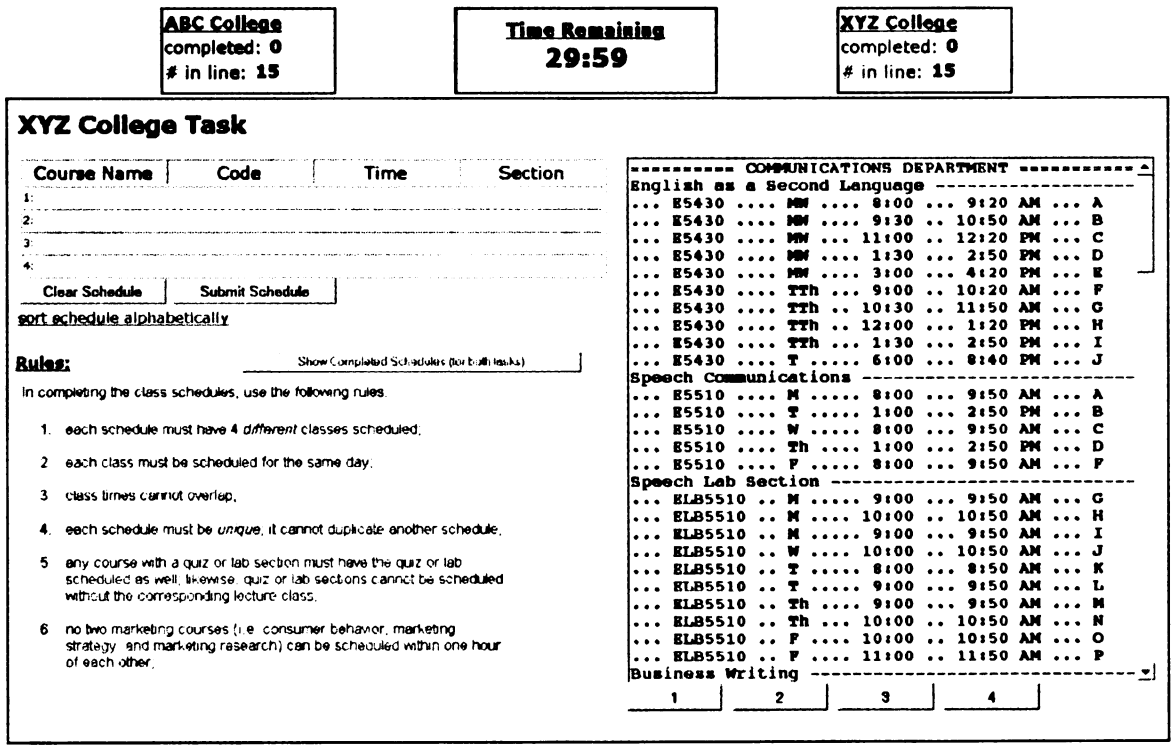


Once you have activated the XYZ College interface, which is displayed below, you are then ready to creating schedules for XYZ College students.



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Appendix D

Task Introduction (page 5 of 6)

A few final notes on the dual-group scheduling interface:

- You can switch from one interface to the other at any point during task performance. It is entirely up to you to decide which group of students you wish to create schedules for at any time during the simulation.
- You can switch from one group to the other part-way through creating a schedule if you choose to do so. That is, you do NOT have to complete the current schedule before switching to work on schedules for the other group.
- If you do switch from one interface to another part-way through creating a schedule, the interface will be exactly the way you left it when you re-select it. For example, let's assume you are working on a schedule for XYZ College students and have already added two courses to the schedule. Let's assume that you then decide to switch to creating a schedule for ABC College students before you have completed the schedule you were working on for the XYZ College students. If you later return to the XYZ College interface, the schedule that you had been working on will still be present, just as you left it.

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Task Introduction (page 6 of 6)

Now you will have an opportunity to get a little experience using the multiple-group class scheduling interface before you begin your work as an academic advisor. You will have 2 minutes to practice with this interface.

Click HERE to begin

Process Questionnaires

Perceived Goal-Performance Discrepancies

ABC College

1. How big of a difference do you feel there is between the actual number of students currently in the **ABC College** line and the goal for the number of students in the **ABC College** line at the end of the simulation?

a) The number of students currently in line is **Much Greater** than the goal
b) The number of students currently in line is **Moderately Greater** than the goal
c) The number of students currently in line is **Somewhat Greater** than the goal
d) The number of students currently in line is **About the Same** as the goal
e) The number of students currently in line is **Somewhat Less** than the goal
f) The number of students currently in line is **Moderately Less** than the goal
g) The number of students currently in line is **Much Less** than the goal

2. Which of the following statements best describes your **ABC College** performance so far in this simulation?

a) My **ABC College** performance is **Much Worse** than the goal
b) My **ABC College** performance is **Moderately Worse** than the goal
c) My **ABC College** performance is **Somewhat Worse** than the goal
d) My **ABC College** performance is **About the Same** as the goal
e) My **ABC College** performance is **Somewhat Better** than the goal
f) My **ABC College** performance is **Moderately Better** than the goal
g) My **ABC College** performance is **Much Better** than the goal

---

XYZ College

1. How big of a difference do you feel there is between the actual number of students currently in the **XYZ College** line and the goal for the number of students in the **XYZ College** line at the end of the simulation?

a) The number of students currently in line is **Much Greater** than the goal
b) The number of students currently in line is **Moderately Greater** than the goal
c) The number of students currently in line is **Somewhat Greater** than the goal
d) The number of students currently in line is **About the Same** as the goal
e) The number of students currently in line is **Somewhat Less** than the goal
f) The number of students currently in line is **Moderately Less** than the goal
g) The number of students currently in line is **Much Less** than the goal

2. Which of the following statements best describes your **XYZ College** performance so far in this simulation?

a) My **XYZ College** performance is **Much Worse** than the goal
b) My **XYZ College** performance is **Moderately Worse** than the goal
c) My **XYZ College** performance is **Somewhat Worse** than the goal
d) My **XYZ College** performance is **About the Same** as the goal
e) My **XYZ College** performance is **Somewhat Better** than the goal
f) My **XYZ College** performance is **Moderately Better** than the goal
g) My **XYZ College** performance is **Much Better** than the goal

Self-Efficacy (variation 1 of 2)

1. How many students do you think will be in the **ABC College** line at the end of the simulation?

a) Less Than 0
b) 0
c) 1 to 3
d) 4 to 6
e) 7 to 9
f) 10 to 12
g) 13 to 15
h) 16 or More

2. How many students do you think will be in the **XYZ College** line at the end of the simulation?

a) Less Than 0
b) 0
c) 1 to 3
d) 4 to 6
e) 7 to 9
f) 10 to 12
g) 13 to 15
h) 16 or More

Self-Efficacy (variation 2 of 2)

Please report how confident you are in your ability to attaining this goal by responding to the following questions [*note:* responses to the items 7 – 8 are based on a 5-point Likert scale ranging from 1 = *strongly disagree* to 2 = *strongly agree*]:

1. I am confident in my ability to achieve this goal.
2. I know that I can achieve this goal if I put in enough effort.
3. I believe that I have or can develop the skills required to meet this goal.
4. Please, indicate the likelihood that you will meet this goal at the end of the simulation:

    - Extremely Unlikely
    - Very Unlikely
    - Somewhat Likely
    - Very Likely
    - Extremely Like

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