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RESEARCH REPORT

# Feedback and the Rationing of Time and Effort Among Competing Tasks

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The study described here tested a model of how characteristics of the feedback environment influence the allocation of resources (time and effort) among competing tasks. Results demonstrated that performers invest more resources on tasks for which higher quality (more timely and more specific) feedback is available; this effect was partially mediated by task salience and task expectancies. Feedback timing and feedback specificity demonstrated both main and interaction effects on resource allocations. Results also demonstrated that performers do better on tasks for which higher quality feedback is available; this effect was mediated by resources allocated to tasks. The practical and theoretical implications of the role of the feedback environment in managing performance are discussed.

*Keywords:* feedback, multiple goals, decision making, expectancies, self-regulation

The fragmented and chaotic nature of organizational life forces many employees to work more or less simultaneously on a variety of tasks that compete for their time and effort (e.g., Brown & Eisenhardt, 1998; Guest, 1956; Jeffrey, 1999; MacDonald, 1982; Mintzberg, 1973; Oshagbemi, 1995). We define competing tasks as multiple activities that require the same limited resource(s) to be completed. Task competition can take many forms. Competition can exist among the end-states an individual strives to attain. For example, individuals often experience conflict related to time allocated to work versus family (e.g., Aryee, Srinivas, & Tan, 2005), as more time spent on one often detracts from time available for the other. Likewise, many jobs are multifaceted. For example, the "balanced scorecard" management approach (Kaplan & Norton, 1992) emphasizes the simultaneous primacy of financial, customer, innovation, and business process activities in order to achieve long-term business success. Competition also can exist among the various means to attain the same end-state. For instance, professors typically have multiple research projects underway concurrently, and must allocate time across these projects to meet their scholarly objectives. Regardless of whether tasks contribute to the same or differing end-goals,[1] when tasks require use of the same limited resources—such that engagement in one activity prohibits (or minimizes) engagement in another at the same time—individuals must allocate their time and effort among tasks at a given point in time. Thus, consistent with Allport's (1989) notion of selection-for-action, we focus on situations in which individuals can only work on one activity at once, but can freely shift back and forth among activities over time.

An important concern in this kind of environment is how employees ration their scarce time and effort among multiple tasks that compete for their attention (e.g., Becker, 1965; Emsley, 2003). Unfortunately, relatively little is known about how people allocate their cognitive resources and manage their performance among competing tasks (e.g., Emsley, 2003; Harackiewicz, Barron, Pintrich, Elliot, & Trash, 2002; Locke & Latham, 1990). Organizations often intentionally influence employees' allocation of scarce resources among competing tasks by providing mission statements (Nelton, 1994) and/or job descriptions (Grant, 1988) that capture the scope and ordering of priorities from the organization's perspective, or use monetary incentives (e.g., Wiley, 1993) to signal organizational priorities. Such incentives have been shown to significantly influence the allocation of time across competing tasks (A. M. Schmidt & DeShon, 2007).

Frequently provided knowledge of results has been shown to enhance performance on a *single* task (e.g., Locke & Latham, 1990) and to affect effort allocation across multiple tasks (Larson & Callahan, 1990). The present research expands this stream of

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[1] Even when activities apparently lead to differing end-goals, these end-goals themselves often lead to a common, higher level end-state. For example, although research and teaching represent largely distinct elements of an academic position, they both contribute to common end-states such as promotion, tenure, and merit increases. Likewise, at a more abstract level, work and family activities both contribute to common end-states such as overall well-being.

work by examining characteristics of the immediate work environment—specifically, the availability of knowledge-of-results feedback (e.g., Ashford & Northcraft, 2003)—that may influence the rationing of time and effort among competing tasks. All work takes place in a "feedback environment" (Hanser & Muchinsky, 1978) in which the feedback available to performers varies (Greller & Herold, 1975; Northcraft & Earley, 1989). Researchers note that in addition to receiving feedback from supervisors, individuals often scan the feedback environment for cues about how well they are performing (Ashford & Cummings, 1983). In the present study, we examined how the quality of feedback available in that feedback environment (i.e., the timing and specificity of feedback available for various tasks) affects individuals' allocation of resources (e.g., time and effort) among competing tasks. Because the allocation of time and effort are critical to strategy development (e.g., Earley, Shalley, & Northcraft, 1992), determinants of resource allocations also should influence performance on those tasks.

Thus, although organizations may attempt to highlight *intended* priorities for performers by providing feedback, performers' idiosyncratic *enactment* of task priorities based on their interpretation of the feedback available in the work context (Ashford & Northcraft, 2003) is also important. Unless managed strategically, the feedback environment could lead performers to enact task priorities that conflict with the organization's interests. Prioritization of competing tasks is important, as it can lead to changes in task performance in multiple-task settings (Edmister & Locke, 1987).

## Feedback as a Rationing Mechanism

Although scholars have frequently called for research on self-regulation in the context of multiple tasks (e.g., Austin & Vancouver, 1996; Carver, 1994; Donovan, 2001; Locke & Latham, 1990; Mitchell & Daniels, 2002), relatively little work has addressed the issue. However, an emerging body of research has demonstrated the influence of the relative difficulty of the goals associated with competing tasks and/or the relative progress toward attaining those goals (e.g., Erez, Gopher, & Arzi, 1990; Kernan & Lord, 1990; A. M. Schmidt & DeShon, 2007; A. M. Schmidt & Dolis, 2009; A. M. Schmidt, Dolis, & Tolli, 2009; K.-H. Schmidt, Kleinbeck, & Brockman, 1984). For example, Erez et al. (1990) and K.-H. Schmidt, Kleinbeck, and Brockman (1984) found that differences in goal difficulty across two concurrent tasks strongly predicted resource allocation, such that the greater the goal difficulty for a particular task, the more individuals devoted resources to that task at the expense of the other task. Similarly, A. M. Schmidt and DeShon (2007) found that individuals tended to allocate more time toward whichever of two tasks was farthest from goal attainment at the time. Although the nature of these effects is complex, being moderated by various individual and contextual factors such as goal orientation, incentives, time-to-deadline, task expectancies, and environmental volatility (e.g., A. M. Schmidt & DeShon, 2007; A. M. Schmidt & Dolis, 2009; A. M. Schmidt et al., 2009), this research consistently demonstrates the important influence of performance perceptions on subsequent time allocation.

The strong effects of goal difficulty and goal progress suggest that feedback similarly plays an important role in resource allocation, given that a primary benefit of knowledge-of-results feedback (e.g., Guadagnoli & Kohl, 2001) is that it allows performers to monitor progress toward task completion over time so that necessary adjustments in task strategy, amount of effort, and *direction* of that effort can be made (e.g., Carver & Scheier, 1998; Locke & Latham, 1990; Powers, 1978). Thus, differences in feedback available for competing tasks should result in corresponding differences in time and effort allocation. Although the vast majority of research on knowledge-of-results feedback has taken a single-task approach, some research supports this contention. For example, Larson and Callahan (1990) found that individuals given two tasks allocated more attention to the task for which feedback was provided. Similarly, K.-H. Schmidt et al. (1984) found that the provision of a difficult-specific goal and feedback for one task resulted in greater emphasis on that task to the neglect of another task. In a team setting, DeShon, Kozlowski, Schmidt, Milner, and Wiechmann (2004) found that provision of individual or team feedback resulted in a corresponding emphasis on individual or team responsibilities; provision of both individual and team feedback resulted in fairly balanced emphasis on both sets of responsibilities.

Whereas these prior findings demonstrate the potential importance of feedback in resource allocation, their focus has been limited to the mere *presence versus absence* of feedback. However, in the workplace, even when feedback is provided in one form or another for all tasks, tasks can differ widely in the *characteristics* or *quality* of the feedback that is provided. To our knowledge, no existing research has examined how feedback quality influences allocation of resources across competing tasks. Our study addresses this key gap. We focus on two dimensions of feedback quality: feedback timing (e.g., Kang, Oah, & Dickinson, 2003) and the specificity of feedback content (e.g., Earley, Northcraft, Lee, & Lituchy, 1990). As noted by Edmister and Locke (1987), equally timely and specific feedback for all tasks individuals must pursue ". . . is probably the exception rather than the rule" (p. 516). Feedback that is more timely or more specific—and particularly feedback that is more timely and more specific—should be higher quality because it will be more helpful to performers (e.g., Earley et al., 1990). Higher quality feedback should serve to attract performers when multiple tasks are competing for time and effort.

As Figure 1 shows, in the present study, we examined two mechanisms by which feedback quality (timing and specificity) might lead performers to allocate time and effort among competing tasks. First, feedback quality may increase the *salience* (e.g., Taylor & Fiske, 1978) of a particular task among a performer's competing tasks. Just as receipt of feedback will cue a performer to think about a task (Vroom, 1964), higher quality feedback in the environment for any one of several competing tasks should cue a performer to think more about that task. The enhanced salience of the higher quality feedback task should lead the performer to allocate more time and effort to that task. High-quality feedback essentially helps "keep the goal at the center of one's attention, which may prevent distraction from undermining one's commitment and increase the likelihood that such commitment would actually fuel goal pursuit" (Shah & Kruglanski, 2003, p. 1110).

Higher quality feedback motivates further consideration of the strategies a performer is using in the conduct of his or her work (e.g., Earley et al., 1990). It allows performers to diagnose performance problems and to adjust strategies as needed (e.g., Prue & Fairbank, 1980). These steps help performers feel more hopeful about some tasks. Thus, a second mechanism by which feedback quality affects resource allocation is by altering expectancies for task performance (e.g., Kernan & Lord, 1990; A. M. Schmidt &

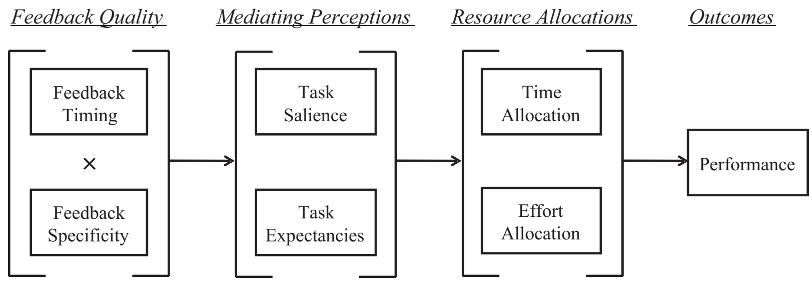


*Figure 1.* Hypothesized model of the effects of feedback timing and feedback specificity on resource allocation.

Dollis, 2009). In effect, time and effort will be perceived to have differential "payback" when invested in tasks for which high-quality feedback is available.

Finally, time and effort allocation typically have strong and direct influences on task performance (e.g., A. M. Schmidt & Dolis, 2009); time and effort have been identified as two critical mediators of the effects of task prioritization on task performance (e.g., Locke & Latham, 2006). Simply put, performance generally increases as more time is invested in a task. Thus, the effects of feedback quality on resource allocation should also result in downstream influences on performance. Thus, Figure 1 shows that the effect of feedback quality on performance is mediated by time and effort allocation. These arguments suggest the following hypotheses:

> *Hypothesis 1 (H1):* The differential quality (timing and specificity) of feedback among tasks will influence the allocation of resources (time spent and effort) among competing tasks.

> *Hypothesis 2 (H2):* The effects of feedback quality on resource allocation will be mediated by task salience and task expectancies.

> *Hypothesis 3 (H3):* The differential quality (timing and specificity) of feedback available among different tasks will influence performance among competing tasks.

> *Hypothesis 4 (H4):* The effect of feedback quality on task performance will be mediated by the allocation of resources (time spent and effort).

We tested these hypotheses in the context of a laboratory experiment in which participants worked simultaneously on four competing tasks over seven time periods. Available feedback varied across the four competing tasks in its timing and specificity.

# Method

## Participants and Task Description

Undergraduate students ($N$ = 55; 38 men, 17 women; $M_{\text{age}}$ = 21) participated in the study for course credit in an introductory organizational behavior course. Participants worked simultaneously on four computer-based class-scheduling tasks adapted from A. M. Schmidt and DeShon (2007); this task has previously been used to examine the impact of goal performance discrepancies on time allocation across competing tasks (e.g., A. M. Schmidt & Dolis, 2009; A. M. Schmidt et al., 2009). Participants created class schedules for students from four different colleges at a fictitious university, which were referred to as *ABC College*, *XYZ College*, *CBA College*, and *ZYX College*. Thus, one task consisted of creating schedules for ABC College students, a second task was creating schedules for XYZ College students, and so on. A separate but equivalent interface was presented for each college (see Figure 2). Only one task could be accessed at a time, during which the others were obscured from view. Participants could access the interface for each task by clicking on the corresponding labels at the top of the screen, and participants were free to switch back and forth among the four tasks. A strength of this design is that the competing tasks are quite identical, so choices among them cannot reflect characteristics of the task, thus allowing stronger inferences concerning the influences of feedback quality.

Participants had 35 min to create as many valid class schedules as they could for each college. To be considered valid, class schedules were required to conform to a set of rules (e.g., "each schedule must be unique"; "no two marketing courses can be scheduled within one hour of each other"; etc.). Participants were told the rules during a brief instructional period at the beginning of the study, and the rules were visible on the screen during task performance. Whether valid or not, the active schedule was cleared from the screen upon clicking the "Submit Schedule" button, and a new blank schedule form appeared. Feedback on the number of valid schedules completed for each college was presented at the top of the screen, with the feedback varying across the four colleges, as described below. As shown in Figure 2, feedback regarding the number of valid schedules completed for all four colleges was visible regardless of which college's schedule creation interface was currently visible on the screen. To encourage high performance, each valid schedule submitted earned participants entry into a lottery for a gift certificate to a local restaurant. Thus, higher performance (more valid schedules completed) on each task increased the participant's chances of winning a gift certificate.

## Feedback Quality

A 2 (feedback timing: immediate vs. periodic) × 2 (feedback specificity: high vs. low) within-person factorial design was used in this study, with feedback quality for each of the four colleges representing a unique combination of feedback timing and feedback specificity. For the two colleges for which feedback was immediate, feedback indicating the number of valid schedules created for that college was updated continuously in real time;

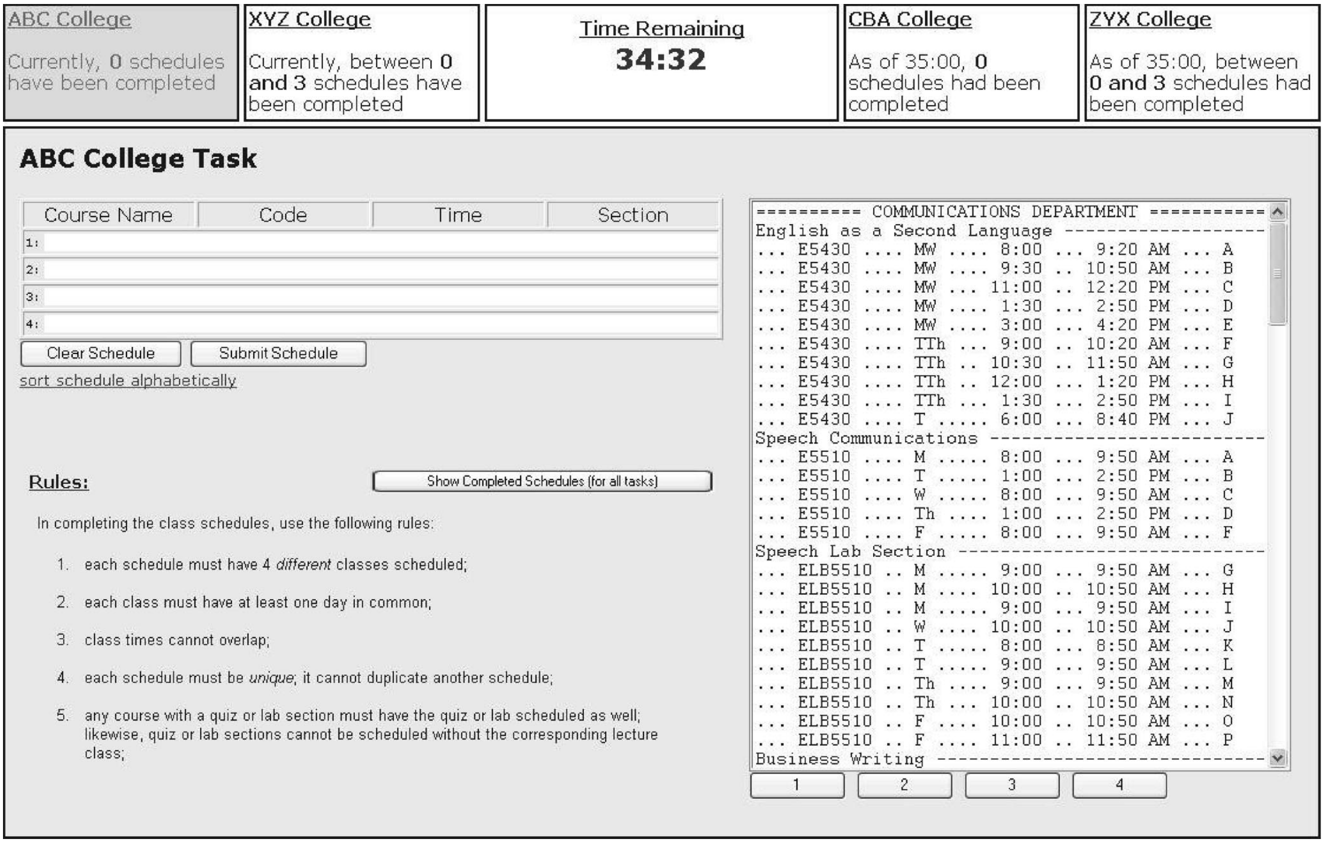


*Figure 2.* The class scheduling task interface.

feedback was updated every 6 min for the colleges for which feedback was provided periodically. The exact numbers of valid schedules created was provided for the two colleges for which feedback was high specificity; ranges of valid schedules created were provided for the two colleges for which feedback was low specificity (e.g., between zero and three schedules completed).

## Measures

*Resource allocation* was assessed two ways: (a) as the proportion of *time* participants spent on each college during the 35-min performance period and (b) as the number of schedules submitted for each college (*effort*), whether correct or incorrect. Given the strong correlation between these two indicators ($r$ = .81) as well as their conceptual overlap, they were combined into a single measure by first transforming both indicators into $z$-score metrics and then averaging the $z$-transformed variables.[2] *Performance* was the number of schedules *correctly* submitted for each college. At the study's halfway point (i.e., 17:30 into the task), the timer was paused and computer-administered self-report measures of the proposed mediators—task salience and task expectancies—were assessed for each of the four colleges. Specifically, following each question (e.g., "For each college, how many schedules do you think you will have *correctly* completed by the end of the task?"), four sets of response options were provided, such that participants provided a separate response for each of the four colleges. *Task salience* was assessed with the following two items ($\alpha$ = .82): "To what extent do you find yourself thinking about each college?" and "To what extent is your attention being captured by each college?" *Task expectancies* were assessed via the following two items ($\alpha$ = .64):[3] "For each college, how many schedules do you think you will have *correctly* completed by the end of the task?" and "For each college, what is the likelihood that you will have *correctly* completed *at least 15* schedules by the end of the task?" Additionally, to further assess the effectiveness of the feedback quality manipulation, *perceived feedback helpfulness* was assessed at the halfway point with the following three items ($\alpha$ = .93): "To what extent is the feedback you are receiving for each college giving you an opportunity to do well?"; "To what extent is the feedback you are receiving for each college allowing you to learn from your mistakes?" and "To what extent is the feedback you are receiving for each college helping your performance?"

Upon conclusion of the class scheduling task, two questions provided manipulation checks for the *timing* ("How often did you receive feedback about your performance on each college?") and

[2] The results and implications of analyzing time and effort allocation separately were consistent with those obtained from the average of the two operationalizations.

[3] Given the somewhat low correlations for the expectancy items, they were also analyzed separately, with the two items serving as alternative operationalizations of task expectancies. This yielded results consistent with those obtained by using the average of the two items.

*specificity* ("How specific was the feedback you received about your performance on each college?") of the feedback provided.

## Results

### Analysis Plan and Preliminary Analyses

We used a repeated measures design and observed all variables for each of the four tasks (Level 1) performed by each participant (Level 2), resulting in four nested observations per participant on each variable. Because both outcomes and predictors were repeated measures, we used multilevel modeling, implemented via the MIXED procedure in SAS Proc with maximum-likelihood estimation (e.g., Moser, 2004; Singer & Willett, 2003). We collapsed time and effort allocation (although assessed second-by-second across the 35-min simulation) into a single observation per task for the hypothesis tests. In supplementary analyses, we explore the dynamic effects of feedback quality on resource allocation across time, via a three-level nested structure (observations across time, nested within tasks, nested within individuals).

The bottom row of Table 1 reports the intraclass correlation(1) coefficients representing the proportion of variance of each variable due to (a) between-person differences and (b) within-person differences (i.e., across tasks). Significant within-person variation exists for each of the study variables. Because the hypotheses are focused on the within-person effects, predictor variables in the analyses are centered within -person (Hofmann & Gavin, 1998; Raudenbush & Bryk, 2002). Table 1 also presents the correlations among the within-person-centered variables. Table 2 presents means and standard deviations for the study variables, by condition.

Feedback quality is multidimensional—consisting of the main effects of feedback timing and feedback specificity and the interaction of timing and specificity—so we used a multistage evaluation of its effects. To provide an omnibus test of the effects of feedback quality on each outcome of interest, we first compared the log likelihood of a full model for a particular outcome, including main effects of timing and specificity and their interaction, with that from a reduced comparison model for the same outcome variable that excludes the predictors of interest (e.g., Singer & Willett, 2003). For most models, the comparison is a "null model" (i.e., no predictors), except for the incremental effects of feedback quality beyond the proposed mediators, for which the comparison model includes the mediators but excludes feedback quality. The differences in these log likelihoods, referred to delta deviance or $\Delta D$, take on a chi-square distribution with 1 degree of freedom for each additional parameter in the model (i.e., 3 *df*s for the two main effects and interaction term). Thus, a significant $\Delta D$ for omnibus feedback quality indicates that, as a set, timing, specificity, and their interaction are significant predictors of the outcome. We then follow these omnibus tests with an examination of the individual parameters to determine whether timing, specificity, and/or their interaction significantly affect the outcome.

Table 1
*Correlations Among Within-Person-Centered Variables*

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Feedback timing | — | | | | | | |
| 2. Feedback specificity | .00 | — | | | | | |
| 3. Feedback helpfulness | .46 | .45 | — | | | | |
| 4. Task salience | .19 | .25 | .33 | — | | | |
| 5. Expectancy | .32 | .34 | .39 | .41 | — | | |
| 6. Resource allocation | .28 | .31 | .52 | .40 | .44 | — | |
| 7. Performance | .30 | .37 | .58 | .37 | .51 | .85 | — |
| ICC(1) | .00 | .00 | .10 | .49 | .62 | .00 | .30 |
| 1-ICC(1) | 1.00 | 1.00 | .90 | .51 | .38 | 1.00 | .70 |

*Note.* ICC(1) indicates the proportion of variance occuring *between* participants; 1-ICC(1) indicates the proportion of variance occuring *within* participants (i.e., across tasks). ICC = intraclass correlation.

**Manipulation checks.** Feedback timing significantly influenced perceptions of feedback timing ($\gamma = 1.95$), $F(1, 193) = 75.12$, $p < .001$; feedback specificity significantly influenced perceptions of feedback specificity ($\gamma = 1.40$), $F(1, 193) = 44.23$, $p < .001$. Additionally, feedback timing was positively related to perceptions of feedback specificity ($\gamma = 1.06$), $F(1, 193) = 30.23$, $p < .001$, and feedback specificity was positively related to perceptions of feedback timing ($\gamma = 1.40$), $F(1, 193) = 50.24$, $p < .001$. As additional verification of the feedback quality manipulations, feedback quality significantly influenced the perceived helpfulness of feedback ($\Delta D = 46.1$, $df = 3$, $p < .001$, $r^2 = .44$),[4] including main effects for feedback timing ($\gamma = 1.58$), $F(1, 192) = 40.54$, $p < .001$, $r^2 = .22$; feedback specificity ($\gamma = 1.52$), $F(1, 192) = 43.20$, $p < .001$, $r^2 = .19$; and their interaction ($\gamma = 1.04$), $F(1, 192) = 14.96$, $p < .001$, $r^2 = .03$. The nature of these effects were such that the perceived helpfulness of more specific feedback increased when that feedback was also immediate, and vice versa. Taken together, these results confirm the effectiveness of the feedback quality manipulations.

**H1 and H2.** H1 proposed that feedback quality would influence allocation of time and effort across the four tasks. As Table 3 shows, participants allocated more resources to colleges providing higher quality feedback ($\Delta D = 20.7$, $p < .001$, $r^2 = .20$). Specifically, participants allocated more resources to colleges providing both more specific and more timely feedback. Feedback timing and feedback specificity also interacted, with the effects of feedback timing being accentuated when feedback specificity was high, and vice versa (see Figure 3). Together, these results strongly support H1: Participants allocated more resources (time and effort) to tasks providing higher quality (more timely and more specific) feedback.

H2 proposed that the effects of feedback quality on resource allocation would be mediated by task salience and expectancies. Feedback quality significantly influenced both task expectancies ($\Delta D = 23.6$, $p < .001$, $r^2 = .24$) and task salience ($\Delta D = 10.5$,

[4] Because true $R^2$'s do not exist for maximum-likelihood analyses, we provide estimates, labeled $r^2$, which represent the squared correlation between the predicted and observed outcomes. Furthermore, because our focus is on the within-person relationships, both predictors and outcomes were centered when deriving $r^2$ (whereas only the predictors were centered in the multilevel modeling hypothesis tests themselves), such that $r^2$ represents the proportion of *within-person* variation being accounted for by the predictor(s). $R^2$ values associated with individual predictors reflect the unique variance in the outcome accounted for by that predictor, controlling for other predictors in the model, whereas $r^2$ values associated with omnibus models represent the total within-person variance in the dependent variable accounted for collectively by all predictors in the model.

Table 2
*Means by Condition*

| | Immediate feedback | | | | Periodic feedback | | | |
|---|---|---|---|---|---|---|---|---|
| | Vague | | Specific | | Vague | | Specific | |
| Variable | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Resource allocation | −0.36 | 0.73 | −0.08 | 0.85 | −0.14 | 0.64 | 0.61 | 1.06 |
| Performance | 5.06 | 3.69 | 6.22 | 4.48 | 5.72 | 3.59 | 9.96 | 6.38 |
| Salience | 5.72 | 3.58 | 6.53 | 3.38 | 6.23 | 3.48 | 7.72 | 4.10 |
| Expectancy | 2.10 | 1.48 | 2.46 | 1.63 | 2.43 | 1.68 | 3.43 | 2.38 |
| Helpfulness | 2.38 | 1.33 | 3.32 | 1.44 | 3.43 | 1.58 | 5.28 | 1.84 |

$p < .001$, $r^2 = .10$). As shown in Table 3, participants reported greater expectancies and greater perceived salience for colleges providing more frequent and more specific feedback. Feedback timing and feedback specificity also significantly interacted in their effects on task expectancies. These results indicate that feedback quality significantly influenced both task expectancies and task salience, as predicted. In the second step of testing the proposed mediation chain, the pair of mediators—task expectancies and task salience—were significant positive predictors of resource allocations ($\Delta D = 36.2$, $p < .001$, $r^2 = .10$), as detailed in Table 3.

To compute the indirect effects of feedback quality on resource allocations via the proposed mediators, the coefficient for the relationship between the distal predictor and the mediator was multiplied by the coefficient for the relationship between the mediator and a distal outcome; 95% confidence intervals for the indirect effects were derived using the distribution-of-the-product method, which provides more accurate Type I error rates and greater power than the commonly used Sobel test (MacKinnon, Fritz, Williams, & Lockwood, 2007). As detailed in Table 4, feedback timing and feedback specificity both demonstrated significant indirect effects on time and effort allocations via both task expectancies and task salience. The Feedback Timing × Feedback Specificity interaction demonstrated a significant indirect effect on resource allocations only via expectancies. Thus, the main effects of feedback timing and feedback specificity on resource allocations were significantly mediated by both task salience and task expectancies; the interaction of timing and specificity on resource allocations was significantly mediated only by task expectancies. As Table 3 shows, feedback quality continued to exhibit a significant (albeit smaller) effect on resource allocations after controlling for the mediators, indicating partial, rather than full, mediation. Taken as a whole, these results provide strong support for H2.

Table 3
*Results of Multilevel Modeling for Hypotheses 1 and 2*

| Model | $\gamma$ | *SE* | $r^2$ |
|---|---|---|---|
| Feedback quality→Resource allocation | | | |
| DV = Resource allocation [$\Delta D = 20.7$, $df = 3$, $p < .001$, $r^2 = .20$] | | | |
| Timing | .462* | .123 | .08 |
| Specificity | .516* | .124 | .09 |
| Timing × Specificity | .472* | .199 | .03 |
| Feedback quality→Mediating perceptions | | | |
| DV = Salience [$\Delta D = 10.5$, $df = 3$, $p < .05$, $r^2 = .10$] | | | |
| Timing | .849* | .391 | .03 |
| Specificity | 1.151* | .345 | .06 |
| Timing × Specificity | .679 | .581 | .01 |
| DV = Expectancies [$\Delta D = 23.6$, $df = 3$, $p < .001$, $r^2 = .24$] | | | |
| Timing | .651* | .132 | .10 |
| Specificity | .679* | .150 | .11 |
| Timing × Specificity | .642* | .270 | .03 |
| Feedback quality and mediating perceptions→Resource allocation | | | |
| DV = Resource allocation [$\Delta D = 36.2$, $df = 5$, $p < .001$, $\Delta r^2 = .10$] | | | |
| Timing | .298* | .124 | .03 |
| Specificity | .326* | .126 | .03 |
| Timing × Specificity | .309 | .193 | .00 |
| Salience | .074* | .027 | .04 |
| Expectancies | .150* | .066 | .03 |

*Note.* Bracketed values indicate significance of the associated predictors set. $\Delta D$ = difference in log-likelihood full set of associated predictors versus a reduced model without the specified predictors; $r^2$ = squared correlation of predicted outcome with observed outcome (centered within-person).
* $p < .05$.

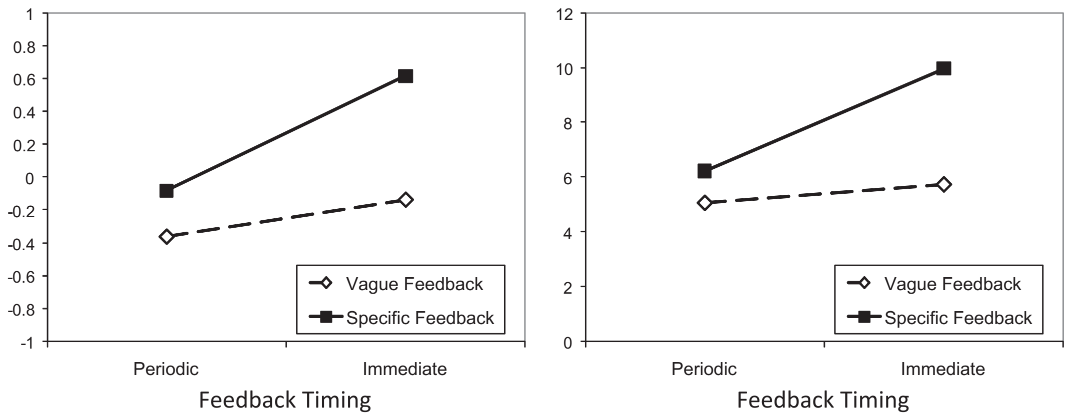


*Figure 3.* The effects of feedback timing and specificity on resource allocation (top panel) and performance (bottom panel).

**H3 and H4.** As summarized in Table 5, support was found for H3 linking feedback quality and performance across the four competing tasks ($\Delta D = 25.7$, $p < .001$, $r^2 = .27$). We observed significant effects on performance for feedback timing, feedback specificity, and the Timing × Specificity interaction, such that the positive effects of timely and specific feedback were accentuated when both characteristics were present. These results provide strong support for H3.

H4 proposed that the effects of feedback quality on performance would be mediated by resource allocations. As shown in Table 5, resource allocations positively predicted task performance, above and beyond feedback quality, feedback salience, and task expectancy ($\Delta D = 114.3$, $p < .001$, $r^2 = .38$). In support of H4, controlling for resource allocations, feedback quality minimally predicted performance ($\Delta D = 10.1$, $p < .05$, $r^2 = .02$), suggesting that resource allocations partially, albeit significantly, mediate the impact of feedback quality on performance. Feedback timing, feedback specificity, and their interaction all demonstrated significant indirect effects on performance via resource allocations, as reported in Table 4. As a whole, these results support H4 such that resource allocations mediate the effects of feedback quality on performance.

## Supplemental Analyses

We also examined whether the effects of feedback quality on resource allocations evolved over the course of the simulation. For these analyses, we divided the simulation into seven 5-min segments. As these were exploratory analyses, we treated time as a seven-level categorical variable, which places fewer constraints on the analyses than specifying a linear or curvilinear effect (e.g., time$^2$, time$^3$, etc.). For these analyses, time allocation was the percentage of each 5-min segment allocated to each task, and effort allocation was the number of submitted schedules (whether correct or incorrect) for each task during each 5-min segment. As with the primary analyses, these two indicators were again $z$ transformed and then averaged to create a composite of resource allocations within each 5-min segment. This results in a three-level nested data structure, in which seven observations (Level 1) are nested within each of the four tasks (Level 2), which are nested within each participant (Level 3). Controlling for main effects and two-way interactions, we observed a significant three-way interaction among feedback timing, feedback specificity, and time-on-effort allocation, $F(6, 294) = 2.65$, $p < .01$, as well as on time allocations, $F(6, 300) = 3.13$, $p < .01$. As illustrated in Figure 4, the

Table 4
*Indirect Effects of Feedback Quality for Hypotheses 2 and3*

| Path | Indirect effect | 95% CI | |
|---|---|---|---|
| Feedback quality→Mediating perceptions→Resource allocation | | | |
| Timing→Salience→Resource allocation | .063[a] | .005 | .147 |
| Specificity→Salience→Resource allocation | .085[a] | .020 | .175 |
| Timing × Specificity→Salience→Resource allocation | .050 | −.029 | .156 |
| Timing→Expectancy→Resource allocation | .097[a] | .014 | .199 |
| Specificity→Expectancy→Resource allocation | .102[a] | .015 | .210 |
| Timing × Specificity→Expectancy→Resource allocation | .096[a] | .007 | .231 |
| Feedback quality→Resource allocation→Performance | | | |
| Timing→Resource allocation→Performance | 1.412[a] | .672 | 2.181 |
| Specificity→Resource allocation→Performance | 1.579[a] | .827 | 2.362 |
| Timing × Specificity→Resource allocation→Performance | 1.443[a] | .251 | 2.665 |

*Note.* Indirect effects represent the product of the coefficients represented in the specified paths, as reported in prior tables. Confidence intervals (CIs) are computed by distribution of the products (MacKinnon et al., 2007).
[a] Indicates that the 95% confidence interval (CI) does not contain zero.

Table 5
*Results of Multilevel Models Predicting Performance (Hypotheses 3 and 4)*

| Model | $\gamma$ | *SE* | $r^2$ |
|---|---|---|---|
| Feedback quality [$\Delta D$ = 25.7, *df* = 3, $p < .001$, $r^2 = .27$] | | | |
| Timing | 2.204* | .500 | .07 |
| Specificity | 2.704* | .534 | .12 |
| Timing × Specificity | 3.074* | .818 | .07 |
| Feedback quality and mediating perceptions [$\Delta D$ = 40.2, *df* = 2, $p < .001$, $\Delta r^2 = .10$] | | | |
| Timing | 1.457* | .480 | .04 |
| Specificity | 1.890* | .542 | .06 |
| Timing × Specificity | 2.324* | .793 | .03 |
| Salience | .167† | .091 | .01 |
| Expectancy | .907* | .234 | .06 |
| Feedback quality, mediating perceptions, and resource allocation [$\Delta D$ = 114.3, *df* = 1, $p < .001$, $\Delta r^2 = .38$] | | | |
| Timing | .569 | .295 | .00 |
| Specificity | .898* | .343 | .01 |
| Timing × Specificity | 1.415* | .558 | .01 |
| Salience | .027 | .068 | .00 |
| Expectancy | .416* | .171 | .01 |
| Resource allocation | 2.899* | .197 | .38 |

*Note.* Bracketed values indicate significance of the associated predictors set. $\Delta D$ = difference in log-likelihood full set of associated predictors versus a reduced model. For top-most model, the reduced model is a null model without any predictors. For the remaining two models, the reduced model is the model displayed immediately above. $r^2$ = squared correlation of predicted outcome with observed outcome (centered within-person); $\Delta r^2$ = change in squared correlation of predicted outcome with observed outcome (centered within-person), relative to model displayed immediately above.
†$p < .10$ (two-tailed), or at $p < .05$ for one-tailed (directional) test. * $p < .05$ (two-tailed).

hypothesized effects of feedback quality were strongest during the initial 5 min of the simulation and the final 15 min of the simulation. From roughly 5 min to 20 min into the simulation, resources were allocated in a much less predictable manner.

## Discussion

In the present study, we examined how individuals allocate their scarcest resources—time and effort—when faced with multiple tasks that compete for those resources. Past research on this issue has focused on attributes of the tasks themselves (e.g., task difficulty or stage of task completion) or on the organization's explicit attempts to prioritize tasks (e.g., the incentives or importance assigned to a particular task). Our study focused on attributes of the context in which the tasks are performed that can influence resource allocations, but which may not be carefully managed or even understood by organizations. The present study adds to

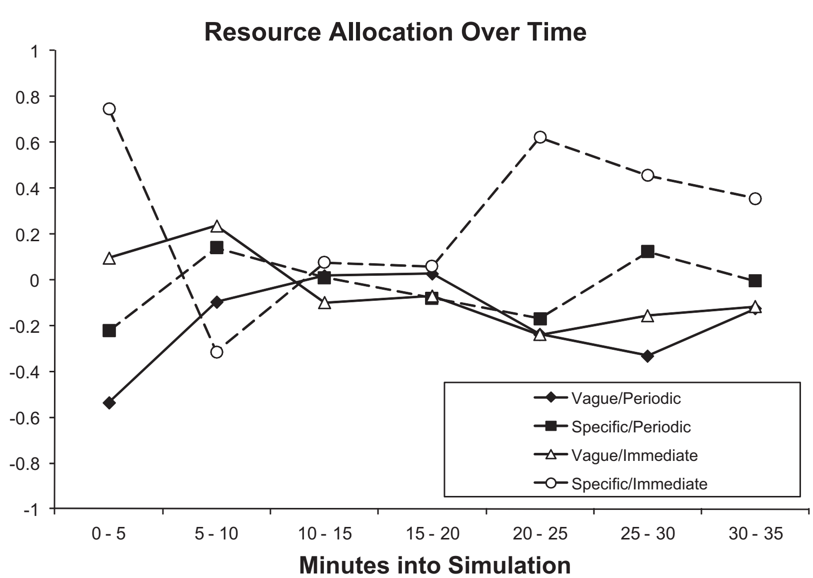


*Figure 4.* Plot of mean resource allocation for feedback quality conditions across time.

researchers' understanding of context effects by examining two aspects of feedback quality—the timing and specificity of feedback available among tasks—and two mediating paths through which the feedback environment may have its effect. These tests of mediation provide insights into the psychological processes that influence resource allocations when performers work on multiple tasks simultaneously.

Our results confirm that feedback quality influences the allocation of resources across competing tasks. Tasks receiving higher quality feedback were more salient, and performers spent more time and effort on those salient tasks. Higher quality feedback also enhanced performers' expectancies for tasks, and thereby led performers to allocate more time and effort to those tasks. Finally, these results occurred even though feedback was knowledge-of-results only. More descriptive and therefore more diagnostic feedback (e.g., Earley et al., 1990) should be even more helpful, and likely would further enhance the effects found in this study.

These results highlight two paths by which the feedback environment might influence the allocation of resources among tasks: (a) a reactive, somewhat mindless path in which the heightened salience of tasks for which higher quality feedback is received leads performers to devote more attention to them without much thought and (b) a more deliberative, mindful path (e.g., Langer, 1992) in which tasks with higher quality feedback are judged to be a more attractive investment of resources. Our results also confirm the importance of these effects, as time and effort allocated to a task paid off in enhanced performance.

Although task salience and task expectancies were strong mediators of the feedback quality effects on resource allocations, feedback quality demonstrated effects beyond those explained via our proposed mediators. One possibility is that more immediate feedback may signal the importance significant others in the performer's environment place on various tasks. Future research should consider additional mediating processes.

Feedback timing and specificity also interacted in their effects on many of the processes and outcomes. For example, the increased resource allocation resulting from more specific feedback was accentuated when the feedback was also timely, and vice versa. Similarly, the greater expectancies brought about by more timely and specific feedback was accentuated when the feedback was both timely and specific. This suggests an important caution: that even very specific (and therefore diagnostic) feedback can only be as useful as its timing. Similarly, the potential benefits of timely feedback may be enhanced by its specificity.

Echoing the findings of others (e.g., A. M. Schmidt & DeShon, 2007; A. M. Schmidt et al., 2009; Love, Love, & Northcraft, 2010), time played a significant but complex role on the impact of feedback characteristics in determining resource allocations. The task for which feedback was specific and timely was immediately the most attractive, and as the simulation wound down, participants came back to that task. However, in the middle of the simulation, feedback quality appeared to do little in driving resource allocations. The early influence of feedback quality may have reflected both the salience of the feedback and its instrumentality for helping participants learn the task more efficiently. Participants may have initially had little confidence that all tasks could be performed well in the available time, thus favoring tasks in which success seemed more likely (A. M. Schmidt & Dolis, 2009; A. M. Schmidt et al., 2009). However, after gaining familiarity with the tasks, multigoal expectancy may have increased, and participants may have sought to "catch up" by allocating time and effort to tasks in which performance lagged. Once the deadline approached, confidence in performing well on all tasks may have again waivered, renewing participants' attention to the most salient path to further performance success (i.e., the task providing higher quality feedback). Overall, these findings suggest that further research is needed to better understand the dynamics of evolving task prioritization over time.

From both a theoretical and practical standpoint, these findings inform the long-standing debate between job design (e.g., Hackman & Oldham, 1980) and social context (e.g., Salancik & Pfeffer, 1977) theories of work motivation and performance. Higher quality feedback (e.g., more timely and more specific) may make a task more interesting and attractive; it may also cue performers as to the importance of the task in the larger organizational context. This finding portends problems if the relative timing and specificity of feedback for tasks does not match the organization's desired priorities, but instead reflect differences in the practical ease of collecting and providing feedback among tasks. Tasks for which it is easier to provide feedback, whether important or not, may garner an unwarranted share of performers' resources. Thus, theories of work motivation in a multitask world need to consider not only how the nature of any one task stimulates effort but also what role the multitask context plays in distributing resources.

In this regard, these findings provide a subtle warning. Managers represent only one source of feedback among many; feedback from other sources (e.g., organizational systems, peers) may draw performers to tasks deemed less important by the organization. Feedback that managers are not explicitly attending to, creating, or controlling can be influencing a performer's resource allocations, pulling performers toward less important tasks and away from higher priority endeavors. Even the task itself may offer feedback to the performer. Although the availability of task feedback can reduce a manager's obligation to provide feedback, it also raises the specter of task-generated feedback influencing allocations independent of, and perhaps counter to, the manager's intentions. Tasks vary in their natural feedback cycles, with some tasks providing very frequent and specific feedback and others infrequent and more ambiguous. A performer may be drawn from important tasks with longer feedback cycles to tasks with more frequent feedback. For example, the immediate and frequent feedback available from simply doing the task of teaching (e.g., students' facial expressions or patterns of class attendance) may draw professors away from other (longer feedback cycle) activities, such as research.

As future research continues to examine competing tasks, a promising distinction can be drawn between demands that compete for an individual's time and effort (e.g., work and family) versus opportunities that compete for an individual's time and effort (e.g., different research projects). In the language of Shah and Kruglanski's (2003) goal networks, demands might be thought of as required subgoals (means) to achieve a focal goal ("I must do A, B, and C to achieve my goal"), whereas opportunities might be thought of as alternative subgoals (means) to attain a focal goal ("I can do A, B, or C to achieve my goal"). Although both demands and opportunities compete for resources, the calculus of allocating resources across opportunities versus demands may be different, because the costs of forgoing demands versus opportunities are likely different. The variance of resource allocations across demands might be smaller than the variance of resource allocations across opportunities because the allocation choice is more constrained for demands than for opportunities (e.g., you have to spend some resources on each required means to a focal goal, but you might not need to spend any time on alternative means to a focal goal). For example, A. M. Schmidt and DeShon (2007) found that, "Greater distance from a given goal resulted in greater time subsequently allocated to that goal" (p. 928) when both goals had separate incentives for goal attainment—a set of consequences perhaps more consistent with competing demands than with competing opportunities. More attention to how the demands/opportunities distinction might moderate the impact of feedback characteristics on resources allocations could prove a fruitful avenue for future research.

Although our study featured two aspects of feedback quality (its timing and specificity), feedback sign (whether feedback is positive or negative) also might influence the mediating perceptions, resource allocations, and (consequently) performance of feedback recipients. More positive feedback is quite likely to elevate task expectancies, which in turn might alter the feedback recipient's relative perceived "payoff" of allocating resources to one of several competing tasks. Higher quality feedback (e.g., more timely and more specific) also seems likely to promote higher quality performance, and hence more positive feedback over time. Thus, although feedback sign seems destined to play a role in the resource allocations of feedback recipients, that role may well be subsumed under the impact of feedback quality on performance. This speculation seems worthy of future research attention.

Our study's findings should be considered in the context of its methodology. Our goal was to demonstrate that the theoretically derived variables (aspects of feedback quality) had their hypothesized effects on the rationing of scarce resources across competing tasks. In real-work organizations, a wealth of complementary and contradictory cues compete with the feedback environment for a performer's attention. In the face of such complexity, the overall effects of any one set of cues (e.g., feedback quality) could be stronger or weaker, or may be more complex than observed here. The relative power of competing cues warrants further study using other tasks and contexts in order to determine whether feedback quality has robust main effects on resource allocations or whether, instead, feedback quality effects interact with task and/or context characteristics. Nevertheless, our findings offer valuable theoretical and practical lessons about the role that the feedback environment plays in allocating performers' time and effort, and the steps that managers might take to better manage these precious organizational resources.

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