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Reflection as a Strategy to Enhance Task Performance after Feedback

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Abstract

An unanswered question in employee development is how reflection can be used for improving performance in organizations. Drawing from research and theory on dual-process models, we develop and test a reflection strategy to stimulate deeper learning after feedback. Results of two studies (N = 640 and N = 488) showed that reflection combined with feedback enhanced performance improvement on a web-based work simulation better than feedback alone. Reflection without feedback did not lead to performance improvement. Further analyses indicated that the proposed reflection strategy was less effective for individuals low in learning goal orientation, low in need for cognition, and low in personal importance as they engaged less in reflection. Together, these findings provide a theoretical basis for the future study of reflection in organizations and suggest a practical and cost-effective strategy for facilitating employee development after feedback in organizations.

Reflection as a Strategy to Enhance Task Performance after Feedback

Does reflecting on past behavior have the potential for improving employee performance in organizations? Several scholars have proposed that, in order to learn from past experiences, it is crucial that employees and managers actively reflect on their performance (Ellis & Davidi, 2005; Hall, 2002; Seibert, 1999). Reflection can be defined as a cognitive process in which the person attempts to increase his or her awareness of personal experiences and therefore his or her ability to learn from them (Gordon & Smith Hullfish, 1961). It involves the absorption and evaluation of new concepts into personal knowledge structures, relating these concepts to the person's other forms of knowledge and experience (Gray, 2007).

Reflection might be particularly important for enhancing feedback interventions. While feedback is believed to direct, motivate, and reward employee behavior, summaries of the feedback literature reveal that feedback does not produce unequivocal positive effects on performance, with a substantial number of studies reporting null or negative effects (Alvero, Bucklin, & Austin, 2001; Kluger & DeNisi, 1996). For this reason, calls have been made for research examining strategies to create an organizational environment that is more supportive of employee development in feedback processes (e.g., Levy & Williams, 2004; London & Smither, 2002; Seifert, Yukl, & McDonald, 2003). Reflection seems a particularly useful strategy for organizations to enhance feedback processing in employees upon receiving feedback (Hall, 2002; Seibert, 1999). The problem with traditional feedback interventions may be that employees take too little time and effort themselves to actively engage in subsequent reflection due to the unrelenting pace and the orientation towards action of the current work environment. Coached reflection (i.e., reflection instigated by some type of formal, deliberate organizational intervention) after feedback, on the other hand, allows employees to step back from action and provides them with formal tools and/or structured activities to help them think through feedback to identify what they have learned from it (Seibert, 1999).

The aim of the current study is to test a reflection intervention after feedback on the basis of theoretical insights from dual-process models (e.g., Chaiken & Trope, 1999; Evans, 2008). As originally suggested by Fedor (1991), dual-process models of information processing may be highly relevant for enhancing feedback processes as these models suggest that different modes of information processing determine cognitive, attitudinal, and behavioral outcomes after feedback. We developed a coached reflection strategy based on these models that requires employees to reflect back and analyze both experiences and thought processes by verbalizing actual examples of past behavior on the basis of the feedback provided. In addition to reflection after feedback, we also test the same reflection strategy in absence of feedback. Some researchers have proposed that reflection is instrumental in enhancing performance even without feedback (e.g., Ellis & Davidi, 2005), while others have argued that, in contrast, reflection without feedback is useless (e.g., Mayer, 2004). By subjecting both approaches to empirical examination, we contribute to this debate and hope to enhance our understanding of the conditions under which reflection can be most effective.

The study was conducted in a web-based development setting wherein employees volunteered to complete a developmental work simulation. In recent years, the use of technology-based employee development instruments such as web-based learning, virtual classrooms, and simulations has increased sharply (DeRouin, Fritzsche, & Salas, 2005). The cost-effective operationalization of the reflection strategies used in the current study fits nicely with this growing interest and should therefore be easily applicable in web-based employee development initiatives.

Theoretical Basis of Reflection

One of the key assumptions of reflection is that it aims to intensify cognitive elaboration of experiential data, leading to the necessary behavioral changes (Daudelin, 1996; Hall, 2002). As dual-process models of information processing suggest that depth of elaboration influences learning and behavioral outcomes, this conceptual framework seems particularly relevant for understanding reflection interventions. An early and well-known

rendition of dual-process models in cognitive psychology is the “depth of processing” framework (Craik & Lockhart, 1972; see also Craik, 2002). This framework proposes that stimuli which receive only incidental attention are processed only to a very “shallow” level in short-term memory. Other stimuli are subjected to more intentional and meaningful processing. In social psychology, dual-process models have been influential, especially in the field of persuasion. Various studies have shown that attitudes formed as a result of effortful thinking are more predictive of behavioral intentions and actions, and are more persistent over time (for reviews, see Cacioppo, Petty, Feinstein, Blair, & Jarvis, 1996; Petty, Wegener, & Fabrigar, 1997).

Dual-process models typically distinguish two modes of cognitive processing. The first mode is characterized by automatic, holistic, relatively fast processes that are undemanding of cognitive capacity, the second by controlled, analytic, and relatively time-consuming processes that are demanding of cognitive capacity (Evans, 2008; Smith & DeCoster, 2000). Another noteworthy feature of these models is that the latter, effortful, elaborate thinking mode often yields outcomes which are different from the former, sparse, economic thinking mode. Among these are alternative solutions to problem-solving and reasoning, better organization of information and integration in memory, a greater likelihood of attitude and behavior change, and less use of stereotypes in judgments. One of the most beneficial outcomes of the effortful processing mode seems to be that it facilitates the learning of new facts or rules. Stimulating thoughtful information processing has, therefore, been advanced as an appropriate intervention to ensure better learning effects (Smith & DeCoster, 2000). Thus, we assume that coached reflection interventions may be instrumental in helping employees switch their mode of information processing from automatic to conscious, leading to better learning from experience (with or without feedback) and enhanced performance.

Combining Reflection with Feedback

In the educational and management literature, there exists considerable debate about whether having learners reflect on their experiences without feedback is an effective

learning strategy. Proponents of reflection without feedback point to research showing that elaborative interrogation (e.g., asking “why” questions after reading) helps students acquire and process information during studying (Seifert, 1993; Woloshyn, Paivio, & Pressley, 1994). Similarly, self-explanation without external feedback has been shown to improve understanding and problem-solving skills (Chi, de Leeuw, Chiu, & Lavancher, 1994). In a review of 19 published studies, Webb (1989) showed that giving self-explanations yielded better learning outcomes than did receiving external elaborate explanations. In the organizational domain, these strategies have been applied in the context of ‘after-event reviews’ (AERs). AERs are organizational learning procedures that give learners an opportunity to systematically analyze their behavior and to evaluate the contribution of its various components to performance outcomes (Ellis & Davidi, 2005). During these AERs no external feedback is provided. Instead, feedback is seen as by-product of the review process: “AER is a kind of guided self-explanation. Feedback, in contrast, is generally provided by an external authority and conveys already elaborated information to the learner” (Ellis & Davidi, 2005, p.858).

However, other authors argue that reflection without feedback is not very effective in learning situations. This position is best articulated in a review article by Mayer (2004) arguing and demonstrating that pure discovery learning strategies with little or no guidance are less effective than instructional strategies involving guidance by external agents. The rationale here is that, when elaborating on the reasons for successes or failures without feedback, learners might try out a variety of different strategies and/or may adopt the wrong strategies for improving performance. Two studies empirically illustrate this position. In one (Moreno & Mayer, 2005), when students were asked to reflect on their problem-solving answers in a multimedia game without receiving feedback, the reflections they provided did not affect learning. The other study (Strange & Mumford, 2005), investigating the role of reflection in vision formation in leaders, found that reflection led to better vision formation only when leaders were exposed to external information on appropriate models. Indeed, without good models from which to learn, reflection resulted in particularly poor performance.

In line with the general principle that reflection without guiding information may be less effective, we expect that providing coached reflection will improve performance more when it is combined with a feedback intervention. That is, we expect that the effect of reflection will be stronger when employees first receive feedback about their performance.

The hypothesis that combining feedback with reflection will be beneficial for enhancing performance leads to the question of how the above mentioned dual-process theory relates to existing feedback theories. We believe that its theoretical arguments are fairly consistent with the main tenets of Feedback Intervention Theory (FIT) (Kluger & DeNisi, 1996). FIT proposes that the effectiveness of feedback depends on the allocation of available cognitive resources. When a feedback intervention directs the feedback recipients' attention to the task at hand, individuals' cognitive resources are allocated towards the task and performance improvement is possible (e.g., by learning new problem-solving strategies). In contrast, when a feedback intervention directs attention away from the task, cognitive resources necessary for skill learning are depleted leading to a decrease in task performance (Vancouver & Tischner, 2004). The reflection strategy used in this study, it is argued, will aid feedback interventions in directing the attention of the feedback recipients' towards the task level, thereby ensuring that cognitive resources are available for performance improvement. It is one of the main assumptions of dual-process models that the 'second' mode of information processing is more demanding of cognitive capacity and relies heavily on working memory capacity (Barrett, Tugade, & Engle, 2004). Dual-process models predict that for feedback to be effective, the necessary cognitive resources should be allocated to the processing of the feedback message. For this reason, it is reasonable to suppose both that dual-process theory may be a useful framework with which to identify variables and strategies that help direct cognitive resources to the task-level in feedback interventions, and also that instigating reflection after feedback will lead to more performance improvement than providing feedback alone.

Operationalization of Reflection

The reflection intervention is based on research in the persuasion domain. In this field, the depth of information processing is manipulated by asking individuals to think about their position towards an argument and generate examples supporting a certain point of view. By thinking about examples, individuals extensively elaborate on the persuasive message, leading to long-lasting changes in attitudes and behavior in the direction of the persuasive message (e.g., Gordijn, Postmes, & de Vries, 2001; Tormala & Petty, 2004). We applied this same strategy to elicit reflection on feedback in the current web-based setting. Upon receiving feedback about their performance on a web-based work simulation, participants were asked to give examples of presumed accurate and inaccurate behavior in the simulation on the basis of the feedback message they received, thereby instigating a deeper processing of the feedback message. As it is still unclear whether negatively or positively framed arguments have a stronger persuasive effect on attitude change (e.g., Petty et al., 1997; Shiv, Britton, & Payne, 2004), we asked participants to provide the same number of positively framed ("What did I do correct in the work simulation?") and negatively framed ("Where did I go wrong in the work simulation?") arguments.

The same reflection strategy was used to examine reflection without feedback. After completing the web-based work simulation, employees were asked to reflect back and analyze both experiences and thought processes by verbalizing actual examples of past behavior, but in this condition without receiving feedback. We also tested the effect of only providing employees with feedback without reflection because an observed effect of reflection combined with feedback on performance improvement might not be caused by reflection, but only by the *feedback message itself*. However, on the basis of dual-process models, we expect that reflection combined with feedback will yield stronger performance increments than feedback alone.

Hypothesis 1: Performance will increase more in a group who receive reflection instructions combined with feedback than it will in groups who (a) receive feedback without reflection instruction, (b) receive reflection instructions without feedback, and (c) receive neither reflection instructions nor feedback.

In addition to examining the effects of reflection and feedback on task performance, we also examined whether the proposed intervention impacts on individuals' reactions to feedback. Research examining feedback reactions is important for numerous reasons. From a practical perspective, for example, feedback reactions represent a criterion of great interest to practitioners because they are vital to the acceptance and use of any feedback system or appraisal system (Cawley, Keeping, & Levy, 1998). If the reflection strategy developed is to be used by practitioners in organizations to enhance feedback interventions, it is important to document employees' reactions to feedback after this intervention. In addition, from a theoretical perspective, feedback reactions are included in almost all theoretical models of the feedback process as the immediate predecessors of performance improvement (Ilgen, Fisher, & Taylor, 1979; Kinicki, Prussia, Wu, & McKee-Ryan, 2004). Previous studies have examined a wide variety of feedback reactions (for a taxonomy of performance appraisal reactions, see Keeping & Levy, 2000). In this study, we focused on perceived utility, perceived accuracy and satisfaction with feedback as, taken together, these reactions provide a good coverage of the construct domain (e.g., Brett & Atwater, 2001; Ilgen et al., 1979). We expect that the proposed reflection strategy will lead to more favorable feedback reactions. By instructing employees to give examples of their behavior on the basis of the feedback and to give them some time to step back and reflect on their performance, employees may be more inclined to see value in the feedback provided and react more positively to it. This expectation is undergirded by previous findings that increased introspection leads to more accurate and less inflated self-views (Sedikides, Hortin, & Gregg, 2007). In turn, we expect these favorable feedback reactions to be related to performance improvement after feedback, as suggested in previous research (Kinicki et al., 2004). These considerations lead to the following hypothesis:

> *Hypothesis 2: The effect of reflection after feedback on performance will be partially mediated by feedback reactions (accuracy, satisfaction, and utility). Individuals who reflect on the feedback will react more favorably than those who do not reflect on it.*

Such favorable reactions will in turn lead to higher performance among the former group than among the latter group.

Note that our hypotheses specify that the mediation effects of discrete feedback reactions will be partial, not full. This is due to the fact that there are multiple discrete feedback reactions that we hypothesize as mediating this relationship (satisfaction, accuracy, utility). More importantly, the dual-process literature documents other and more proximal mechanisms explaining task performance improvement after reflection such as memory, reasoning, and learning effects (DeWall, Baumeister, & Masicampo, 2008; Smith & Decoster, 2000).

Study 1

Method

Participants and Procedure

The sample consisted of 640 employees (58% male, 42% female) from different organizations. Their ages ranged from 17 to 60 years (M = 36.1 yrs, SD = 10.1). The participants had an average working experience of 13.1 years (SD = 10.3) in their company and an average experience of 4.7 years (SD = 5.4) in their current position. The majority (77%) held, at least, a bachelor's degree and 34% had earned an additional advanced degree or professional qualification.

A work simulation task was posted on the website of a governmental service for employment and vocational training. This website contains various freely available links with online courses and self-assessment instruments for work-related skills (e.g., application skills, teamwork skills, computer knowledge, financial courses, and negotiation skills). Given its official and free content, the website is frequently and spontaneously visited by applicants and employees looking for training and coaching in various work-related competencies. The work simulation task was advertised as an instrument that enabled employees to obtain a better picture of their work-related skills (e.g., decisiveness, information management, coordinating, and problem awareness). Given that this instrument was effectively used by the

governmental agency as a career assessment tool on their website, there was no cover story to 'lure' participants into taking part in the field experiment. People who chose to do so were genuinely interested in feedback about their managerial skills and agreed to take part in an experiment in exchange for feedback. Upon completion of a short questionnaire measuring demographic variables, people received a random identifier that gave access to the webpage with the web-based work simulation.

Given the problems typically associated with the use of web-based data collection, the data obtained were carefully screened. As recommended by Stanton and Rogelberg (2001), the following precautions were taken. First, only individuals that entirely completed the work simulation and all measures were included. Furthermore, responses mismatching a master list with valid identifiers were discarded. Finally, when multiple identical responses were detected in the data, all data in the multiple-response group were dropped.

Task

Work simulations are frequently used in organizations for development purposes as they offer employees meaningful feedback to improve their work-related behavior (Thornton & Cleveland, 1990). We adapted a computerized task simulating daily work activities from Tett, Steele, and Beauregard (2003). The work simulation required individuals to respond to a set of realistic e-mails designed to capture key work demands. Care was taken to ensure the realism of the simulation, including role descriptions, background information, graphics, pictures, e-mail simulation, organizational charts, and interactive activities. The simulation comprised a set of ten e-mail messages, designed to measure four work-related performance dimensions taken from of a taxonomy of work performance (Tett, Guterman, Bleier, & Murphy, 2000), namely problem awareness, coordinating, information management, and decisiveness. With each message, participants received four possible responses and were required to rate the effectiveness of each response. On the basis of the scoring rules developed by Tett et al. (2000), we developed a computer program that could automatically score participants' effectiveness ratings on each message for one of the four performance dimensions. An average score of the four performance dimensions is typically computed to

reflect a reliable indicator of overall performance on the work simulation (Lievens & Anseel, 2007).

As it was our aim to examine whether performance on the work simulation improved after reflection and feedback, we needed an alternate version of the simulation that could be used to assess performance at Time 2. As outlined by Clause, Mullins, Nee, Pulakos, and Schmitt (1998), we used a cloning procedure to construct such an alternate version. This cloning procedure consisted of writing for each original item a new message and set of responses measuring the same underlying performance dimension as the original item. Each new item used the same set of grammatical constructions as its original but different content words. This procedure yielded an alternate version of the task that was identical to the original in terms of number and type of options and response options.

To test if mean performance on both work simulation tasks was comparable, a pilot study was conducted. A total of 146 employees (41% women; mean age = 37.5 yrs; organizational tenure = 14.9 yrs; job tenure = 13.0 yrs) completed both tasks in random order. Recruitment of participants in the pilot study was the same as described above for the actual study. A 2 (Order: normal vs. reversed) x 2 (Task: Task 1 vs. Task 2) mixed ANOVA, with repeated measures on the last factor and overall performance on the work simulation as dependent variable, was performed. Results showed neither a significant main effect of task, $F(1,144) = .10$, $\eta^2 = .00$, nor an interaction effect between task and order, $F(1,144) = .00$, $\eta^2 = .00$, indicating adequate alternate-form reliability at the level of the task form and absence of practice or fatigue effects. The two alternate task forms were also presented in random order in the actual study.

Design and Measures

We conducted a 2 (feedback vs. no feedback) x 2 (reflection vs. no reflection) x 2 (task 1 vs. task 2) factorial design with repeated measures on the last factor and overall performance on the work simulation as dependent variable. Participants were randomly assigned to one of four conditions.

No Feedback – No Reflection Condition. After completing the first task, participants received a message that they were halfway through the session and that they had ten more e-mails to respond to before they would receive information about their performance. After this message, participants could start working on the alternate version of the work simulation.

Feedback – No Reflection Condition. After completing the first version of the work simulation, participants received feedback. Given that their responses were automatically scored and they received instant feedback, there was no delay or waiting period between the end of the first task and the reception of feedback. For each performance dimension, a short feedback report was presented, including participants' scores (1-20) on these performance dimensions and a brief explanatory text. To facilitate interpretation of their feedback score, these texts outlined in general terms the behavior of individuals who tend to score very high on a specific performance dimension. An example can be found in Appendix A. The feedback provided in this field experiment was real and aimed to give an accurate picture of participants' managerial skills. At no point in the experiment were participants provided with bogus feedback or fake information. Feedback on each of the four performance dimensions was presented on a separate screen. After participants indicated they had read each report, they were asked to complete the measure of feedback reactions for each performance dimension. Only after having done so were they able to proceed with the second work simulation task.

Feedback – Reflection Condition. After completing the first version of the work simulation task, participants received the same feedback report as in the previous group. However, upon reading the reports, participants were directed to a screen that prompted reflection on their recent performance on the basis of the feedback received. For each of the four performance dimensions, participants were asked to write down (in text boxes) both what they thought they had done well, and to illustrate this with an example of an item which they thought they had answered correctly and also what they thought they had done badly and to illustrate this with an example of an item they thought they had answered incorrectly. This process yielded eight (four correct and four incorrect) "reflections" and examples of their

performance on the first task. After finishing this step, they were asked to complete the measures of feedback reactions for each performance dimension before they were able to proceed with the second simulation task.

No Feedback – Reflection Condition. In this last group, participants did not receive feedback after completing the first task, but were still asked to write down what they thought they had done well/incorrectly and to illustrate this with an example of an item they thought they had answered (in)correctly, as described above. This group allowed us to examine whether reflection without feedback also improved task performance.

Reactions to feedback. We assessed participants' perceptions of the accuracy of the feedback message, the usefulness of the feedback provided and their overall satisfaction with feedback. For each performance dimension, each variable was measured with two items on a 7-point scale taken from previous feedback research (Korsgaard, 1996; Keeping & Levy, 2000). Scores were averaged over performance dimensions to obtain a reliable measure. Example items were 'The feedback I received on [performance dimension] was an accurate evaluation of my performance' (accuracy), 'The feedback I received on [performance dimension] helped me learn how I can improve my performance' (utility), and 'Overall, I was satisfied with the feedback I received on [performance dimension] (satisfaction)'. Internal consistencies for these scales were .81 (accuracy), .95 (utility), and .80 (satisfaction).

Demographic variables. We also obtained data about participants' age, tenure, and educational level.

Results and Discussion

Descriptive Statistics

Descriptive statistics and correlations between all measured variables are reported in Table 1. As can be seen, task performance on Task 1 (T1) and Task 2 (T2) was significantly correlated ($r = .54$, $p < .01$). Age ($r = .10$, $p < .05$), tenure ($r = .09$, $p < .05$) and educational level ($r = .11$, $p < .01$) were all significantly correlated to T1 performance, with higher educated and more experienced employees performing somewhat better, thus providing

some support for the validity of the work simulation. More importantly, perceived feedback accuracy (r = .34, p < .01), feedback utility (r = .24, p < .01) and feedback satisfaction (r = .41, p < .01) were all correlated with T1 performance, demonstrating that participants reacted more favorably to higher performance feedback scores.

Adherence to Intervention Protocol

To check whether participants adhered to the intervention protocol (e.g., reflection instructions), we explored the reflections provided by the participants in the text boxes. Two of the co-authors of this paper, acting independently, scrutinized the written texts. The input of participants who did not follow instructions (e.g., by leaving text boxes blank or writing down irrelevant comments such as, “I don’t know”, “no time”, and “don’t care”) received a score of 0. In all other cases their input received a score of 1. The coders independently coded a random sample of 900 reflection texts (17.2% of both the employee and the student sample in Study 2) to assess inter-rater agreement. Any disagreements in ratings were resolved through discussion. The third author then coded the remaining texts. Cohen’s kappa among coders was .98. Participants’ scores were summed up so that (as they had to complete a total of 8 textboxes) each received a score from 0 to 8. As can be seen in Table 1, the mean score on the adherence variable was 4.19 (SD = 3.07), indicating that there was considerable variability among participants in the extent to which they followed the reflection instructions.

In line with procedures recommended in medical intervention research, we tested Hypothesis 1 first using *intent-to-treat* (ITT) analysis. In ITT analysis all participants, once randomized, are analyzed according to the condition to which they were originally assigned, regardless of adherence to the intervention protocols (Lachin, 2000; Hollis & Campbell, 1999). Thus, using the ITT principle, participants who were randomly assigned to the intervention condition, but who received partial or none of the treatment, would still be analyzed as if they received the full experimental treatment. However, it could be argued that ITT strategies increase the potential for Type II error (i.e., false negatives). Although ITT strategies retain all or most of the participants enrolled, the effect size may be reduced when

portions of the experimental group receive as much intervention as the participants in the control condition. Some scholars believe that the most meaningful results from intervention studies (especially if study participation is not based on a strong need for the treatment) are based on the intervention actually received rather than on the ITT principle. Therefore, an alternative strategy is to use *efficacy subset analysis*. This is defined as the selection of a subset of participants based on criteria identified post randomization (e.g., excluding those who did not participate in a minimum amount of the intervention) to examine the effect of the experimental treatment (also referred to as "per protocol analysis," "explanatory analysis," or "analysis by treatment received") (Lachin, 2000). An important drawback of efficacy subset analysis is that it could inflate the Type I error rate (i.e., false positives) because this analysis might only involve the most successful cases. A reasonable compromise is to conduct both types of analyses and examine the difference in effect sizes generated by each analysis (Gross & Fogg, 2004). This is what we did in our evaluation of Hypothesis 1.

Intent-to-Treat Analysis.

Hypothesis 1 predicted that performance will improve more after reflection combined with feedback than it will after feedback without reflection or reflection without feedback. We tested Hypothesis 1 with planned comparisons on the basis of a 2 (Feedback vs. No feedback) x 2 (Reflection vs. No reflection) x 2 (Task 1 vs. Task 2) design, with repeated measures on the last independent variable and performance on the work simulation task as a dependent variable. Results showed that performance improvement from Task 1 to Task 2 in the Feedback / Reflection condition was higher than performance improvement in the Feedback / No reflection condition ($F(1,635) = 3.99$, $p < .05$, $d = .22$), the No feedback / Reflection condition ($F(1,635) = 66.09$, $p < .01$, $d = .96$), and the No feedback / No reflection condition ($F(1,635) = 70.18$, $p < .01$, $d = .80$). Thus, Hypothesis 1 was supported. The effect size of adding reflection instructions to the feedback intervention was relatively small ($d = .22$). Note that mean performance on Task 1 (T1) did not vary across conditions, $F(3,636) = .46$, $p = .71$, supporting random assignment of participants to conditions. There were no significant differences between T1 performance and T2 performance in the control (No

Feedback / No reflection) condition ($F(1,636) = .02$, $p = .90$), indicating that the results observed were not caused by practice or memory effects. Interestingly, there was also no performance improvement in the No feedback / reflection condition ($F(1,635) = 2.38$, $p = .12$, $d = .10$), indicating that reflection alone did not increase task performance.

Efficacy Subset Analysis

This procedure tested Hypothesis 1 by ensuring that all participants included in the reflection conditions adhered to the 'treatment' and actually reflected on their feedback reports or on their previous performance. As a cut-off, participants receiving a score lower than the mean (4) on the adherence variable, and thus following less than half of the instructions given during reflection, were not included in the *reflection conditions*. Accordingly, 71 participants in the No feedback / Reflection condition and 57 in the Feedback / Reflection condition were excluded from their respective conditions (117 participants obtained a score of 0, six participants received a score of 1, one a score of 2, and four a score of 3). The high number of participants not following instructions can be explained by the web-based setting of the task. In web-based research, participants typically feel less obliged to follow instructions strictly (Stanton & Rogelberg, 2001). Given that these participants took part in web-based reflection but did not adequately follow instructions, we also used this group in an exploratory sense as an additional control group to test the effect of reflection after feedback on performance improvement. As these participants did not actually complete reflections after feedback, we expected them to have a similar performance pattern as employees in the Feedback / No reflection condition. We explored whether there were any apparent differences between the participants who adhered to the intervention and those who did not. Preliminary analyses showed no differences in demographic statistics or in task performance on the first task (T1) ($p > .05$). As can be seen in Table 1, both the number of instructions completed ($r = .16$, $p < .01$) and the number of words written down during reflection ($r = .16$, $p < .01$) were correlated with T2 performance but were uncorrelated with all other variables, indicating that following instructions is not easily explained on the basis of the other variables in this study.

Table 2 presents mean performance scores for the different combinations of the independent variables on the basis of the efficacy subset analysis[1]. Mean performance on Task 1 (T1) did not vary across conditions, $F(3,508) = .18$, $p = .91$. We conducted planned comparisons to test Hypothesis 1 and compared performance improvement from Task 1 to Task 2 (T2) across groups. Performance improvement in the Feedback / Reflection condition was higher than performance improvement in the Feedback / No reflection condition ($F(1,508) = 14.74$, $p < .001$, $d = .48$), the No feedback / Reflection condition ($F(1,508) = 83.94$, $p < .001$, $d = 1.20$), and the No feedback / No reflection condition ($F(1,508) = 94.94$, $p < .001$, $d = 1.07$). Thus, Hypothesis 1 was supported. As can be seen in Figure 1, the use of reflection combined with feedback enhanced the positive effect of feedback on performance most strongly. Performance improvement was higher in the condition wherein participants reflected on the feedback as compared to the condition wherein participants only received feedback. As expected, when only those participants who strictly adhered to the instructions are included, the intervention yielded a stronger effect size: Performance improvement after feedback combined with reflection was considerably higher than performance improvement after feedback alone ($d = .48$). Again, there was no performance improvement in the No feedback / No reflection condition ($F(1,508) = .02$, $p = .69$, $d = .04$). This sheds some new light on the current debate regarding the role of feedback during reflection. Our results seem to be in favor of the standpoint that feedback should be a key component of reflection interventions.

Note that separate analyses for each performance dimension yielded a similar pattern of results, although the results for two of the four dimensions were less pronounced due to ceiling effects. Given that the overall score on the work simulation has a higher reliability than separate performance dimension scores, our aforementioned main analyses were conducted with overall performance scores as dependent variables.

Additional analyses

We conducted three additional analyses in order to produce further evidence in support of our main hypothesis that reflection was responsible for the performance

improvement observed. First, we inspected results from the participants that were not included in the reflection groups in the efficacy subset analysis because they failed to complete the reflection instructions. Results showed that performance improvement of excluded participants in the No feedback / Reflection condition (M = 1.16, SD = 3.86) was not significantly different from that of participants who completed the reflection in this condition (M = .18, SD = 4.61), indicating that reflecting made little difference if participants did not receive feedback, $F(1,188) = 2.28$, $p > .10$, $d = .02$. However, performance improvement of excluded participants in the Feedback / Reflection group was significantly (M = 1.67, SD = 4.45) lower than that of participants in the same group (M = 5.87, SD = 4.88) who actually completed the reflection, $F(1, 188) = 30.87$, $p < .001$, $d = .9$. These results corroborate the conclusion that performance improvement in the Feedback / Reflection group can be attributed to closely following reflection instructions.

Second, we also inspected the depth of processing in the subset that adhered to instructions, as this can shed additional light on the effectiveness of the reflection intervention. The number of words provided during a reflection session is often used as an indicator of depth of processing (Gordijn et al., 2001; Shiv et al., 2004). Computerized word counts yielded the total number of words used in the reflection session by each participant. A GLM analysis with Task as within-subjects factor, number of words as continuous independent variable, and performance on the work simulation task as dependent variable showed that the number of words was indeed a significant predictor of performance improvement in the Feedback / Reflection condition, $F(1,132) = 5.00$, $p < .05$, $\eta^2 = .04$. Thus, the deeper participants reflected on the feedback, the higher their performance improvement. However, the number of words produced was not related to performance improvement in the No feedback / Reflection group ($F(1,117) = 1.40$, $p = .24$), indicating that depth of processing was important only in combination with feedback. Again, these findings support Hypothesis 1 and suggest that the reflection intervention combined with feedback was responsible for the performance improvement. It also shows that reflection without feedback makes little difference, suggesting that feedback should be included during coached reflection.

Finally, we explored whether the reflection intervention combined with feedback helped all performers that adhered to the instructions equally well[2]. On the basis of the correlations found in Table 1, it is apparent that the initial level of performance (T1) had little influence on the depth of processing during the reflection intervention as evidenced by the number of words written down (r = -.02, p > .05) or the instructions completed (r = .00, p > .05). However, it remains a possibility that reflecting after feedback is more effective for low performers than for moderate or high performers. To test this possibility, we created three groups (top third, middle third, and bottom) in the Feedback / Reflection condition by sorting the employees on their initial level of performance (T1) (following e.g., Smither et al., 1995). A GLM analysis with Task as within-subjects factor, and initial level of performance (high, medium, low) as independent variable, and performance on the work simulation task as dependent variable showed that the initial level of performance was a significant predictor of performance improvement in the Feedback / Reflection condition, F(2,132) = 12.92, p < .01. Table 3 presents the mean task performance scores for each group of employees for Task 1 and Task 2. On the basis of the effect sizes reported, one would be inclined to conclude that the reflection combined with feedback was more effective for low (d = 1.98) and moderate (d = 2.31) performers than it was for high performers (d = .80). However, part of the variation in effect sizes might be due to regression to the mean. Therefore, we estimated the amount of increase or decrease in performance in each of the three groups that would be expected solely due to regression to the mean (using the procedures as described by Smither et al., 1995; Walker & Smither, 1999). More specifically, we used the correlation between the scores on Task 1 and 2 (r = .54) as a conservative estimate of reliability. We then used this estimate of reliability in a bivariate regression equation to predict mean Task 2 in each group, given the mean Task 1 performance in each group. As can be seen in Table 3, our results show that regression to the mean accounts for only a small portion of the improvement from Task 1 to Task 2. However, adjusting Cohen's d effect size for regression to the mean shows that improvement was strongest for employees with moderate initial performance (d = 2.41), whereas both low and high initial performance groups showed similar performance

improvement (*d* = 1.49 and 1.58, respectively). In short, the reflection intervention after feedback was most effective for employees with moderate initial performance.

Hypothesis 2

Hypothesis 2 predicted that the effect of reflection after feedback would be partially mediated by feedback reactions such as satisfaction, accuracy and perceived utility. This was tested using Baron and Kenny's (1986) method. Below, we report this test for the subsample that strictly adhered to instructions, on the grounds that analyses with the aim of elucidating the mechanism underlying an intervention might best be done on the group that actually adhered to the intervention protocol. However, it is worth noting that results were exactly the same when the test was conducted on the overall sample. First, the independent variable must be significantly related to both the hypothesized mediator (Path a) and the dependent variable (Path c). Second, it must be shown that the mediator is related to the dependent variable while controlling for the independent variable (Path b) and that the direct path from the independent variable to the dependent variables (Path c) is either zero (complete mediation) or reduced in absolute size (partial mediation). We used Sobel's (1982) statistic to test for the significance of the mediating effect. To get an accurate estimate of the effect of reflection on feedback reactions, we first controlled for task performance at time 1 (T1), which was also the feedback score participants received, in each regression. Previous research demonstrated that feedback scores are probably the most important predictor of feedback reactions. We report effects of the three mediators in Table 4. Contrary to expectations, none of the indirect paths was significant ($p>.05$), indicating that no mediation occurred. Thus, Hypothesis 2 was not supported.

As an additional analysis exploring the effect of reflection on feedback reactions, we also examined whether reflection after feedback interacted with feedback scores in predicting feedback reactions. It might be that the reflection strategy was most effective in enhancing feedback reactions after negative feedback. However, results showed that the proposed interaction effects did not explain any additional variance beyond the main effects for satisfaction (R^2 = .00, $p>.05$), accuracy (R^2 = .00, $p>.05$) or utility (R^2 = .00, $p>.05$). In sum,

we found no evidence that the reflection strategy proposed in this study affected employees' feedback reactions.

Study 2

Study 1 demonstrated that instigating employees to reflect on feedback by writing down examples of behavior on the basis of the feedback received improved their task performance more than employees who received feedback only. However, the intervention that was used for instigating reflection was not a complete success. Although Hypothesis 1 was supported in both the ITT analysis and the efficacy subset analysis, supporting the effectiveness of the proposed intervention, we found a noteworthy difference in effect size (d = .22 vs. d = .48). This means that adherence to the intervention protocol might have affected the reflection intervention. Indeed, a considerable proportion of participants in the reflection groups did not follow instructions and wrote down only half or less of the reflections they were instructed to write. This might be said to limit the usefulness of the intervention to some extent. Preliminary analyses showed that demographic or initial performance differences could not explain why some people did not extensively reflect on the feedback as instructed.

To better understand why the reflection intervention was not effective for some people, we conducted a second study using a student sample. The specific purpose of the study was to test the view that individual differences in dispositional goal orientation ('learning goal orientation'), motivation to think extensively ('need for cognition'), and the personal importance attached to task performance ('personal importance') may affect the extent to which individuals engage in reflection after feedback. To replicate and examine the effects of Study 1, we used exactly the same instructions in this study. Thus, as in Study 1, participants in the reflection conditions were requested to reflect on the feedback, and were able to proceed immediately to the second task without writing anything down if they preferred not to. This study also allowed us to control for self-selection and participant dropout. The generalizability of the results obtained in Study 1 might be limited if only highly motivated employees volunteered for the web-based work simulation. In Study 2, all students

were obliged to complete it. Below, we discuss the three individual differences hypothesized to affect the extent to which individuals engage in reflection after feedback.

Need for Cognition

Need for cognition (NFC) denotes the tendency for individuals to engage in and enjoy effortful cognitive activity. In a demonstration of the construct's predictive validity, Cacioppo and Petty (1982) had individuals perform a number-circling task employing either a simple or a complex set of rules. They found that individuals high in need for cognition preferred to perform the task with the complex rules, whereas individuals low in need for cognition opted for the simple rules. NFC has often been studied in the context of argument quality and persuasion. Individuals low in NFC tend to be influenced by simple and peripheral cues in persuasion settings, whereas individuals high in NFC think more carefully about the substantive information in these settings (Cacioppo et al., 1996). NFC is also positively correlated with effort, enjoyment, and performance on challenging tasks (Dornic, Ekehammar, & Laaksonen, 1991). Individuals high in NFC are likely to proactively seek, acquire, and reflect on information to make sense of stimuli and events (Cacioppo et al., 1996). Most importantly for this study, research consistently shows that people high in NFC come up with more and better quality arguments when processing persuasive information than those low in NFC (Cacioppo et al., 1996). Therefore, we expect that the proposed reflection intervention is most congruent with a high NFC and thus the intervention to be most effective for participants high in NFC.

Hypothesis 3: Participants with a high Need for cognition will engage more in reflection after feedback during a reflection intervention than participants low in Need for cognition.

Learning Goal Orientation

Recently, goal orientation has received a lot of attention in performance feedback research. Goal orientations are personal goal preferences in achievement-related situations. Two broad classes of underlying goals have been distinguished: (a) A learning goal

orientation to develop competence by acquiring new skills and mastering new situations, and (b) a performance goal orientation to demonstrate and validate the adequacy of one's competence by seeking favorable judgments and avoiding negative judgments about one's competence (Vandewalle, 2003). In the last decades, various studies have examined the differential effects of learning goal orientation and performance goal orientation. Goal orientation theorists now generally agree that this orientation is the ideal type of competence-based regulation for learning and development (Pintrich, 2000). A learning goal orientation is assumed to cause individuals to view the task as a challenge, elicit feelings of excitement, and encourage cognitive and affective immersion in the activity for the sake of skill development and self-improvement (Elliot & Church, 1997; Elliot & McGregor, 2001). It has been documented that learning goal oriented individuals process learning information at a deeper level (Ames & Archer, 1988; Pintrich, 2000) and are more cognitively engaged in a task (Pintrich & Schrauben, 1992). Of specific interest for the current study is that people with a high learning goal orientation report using more deep processing strategies for the storage of information in long-term memory, for creating connections between the aspects that needed to be learned and for helping to integrate the new knowledge with their existing knowledge. Given this tendency, we expect that people with a high learning orientation will be naturally inclined to engage in reflection in achievement situations and thus will be more inclined to write down their thoughts and examples of behavior during a reflection intervention.

Hypothesis 4: Participants with a high learning orientation will engage more in reflection after feedback during a reflection intervention than participants with a low learning orientation.

Personal Importance

The third variable hypothesized to affect the depth of processing is personal importance. Personal importance in this study refers to the extent that participants feel that a performance dimension is personally important to them. Previous research in the persuasion domain has repeatedly shown that when a particular issue is of high perceived personal

relevance to individuals, they are inclined to examine the content of the information presented more carefully. Information which is perceived as highly personally relevant is more likely to be processed in depth than that which is believed to be irrelevant. As an issue increases in personal relevance, it becomes more important for them to form a reasoned and veridical opinion, and people become more motivated to devote the cognitive effort required to evaluate the issue-relevant arguments that are presented (Petty & Cacioppo, 1979, 1986). We believe that a similar mechanism may be occurring in the current studies. More specifically, we believe that when participants perceive the performance dimensions under study to be of high personal relevance to them, it becomes more important for them to scrutinize closely the feedback received to examine how it might help them improve their performance. Therefore, we expect that personal importance may motivate participants to devote more cognitive effort to evaluating their performance in light of the feedback provided. This should be reflected in the extent to which participants engage in reflective activities. Thus, we expect that the extent to which each of the performance dimensions is personally important to participants will be related to the number of words written down during the reflection intervention.

Hypothesis 5: Participants who report the task to be personally important to them will engage more in reflection after feedback during a reflection intervention than participants that report the task to be less important.

Method

Participants and Procedure

The sample consisted of 488 college seniors from different majors (e.g., engineering, agricultural and plant sciences, communication, education) participating as part of a course on group dynamics and management skills. Participants had an average age of 22.2 years (*SD* = 2.1); 67% were female, 33% male. Sessions were conducted in groups of 45 individuals. Participants arrived in a classroom and were seated at a computer. They were told that a work simulation such as the one they were about to complete is often used for assessing and developing junior managers and that therefore this computer task would

enable them to better prepare themselves for their future careers. Exactly the same task and design were used as in Study 1. However, before starting the work simulation, participants completed a number of online questionnaires that would also give them a better picture of their work roles and teamwork styles during the courses on group dynamics. Included in these questionnaires were the measures of learning goal orientation, need for cognition, and personal importance.

Measures

Need for cognition was measured by a 15-item Dutch version (Pieters & Verplanken, 1995) of Cacioppo, Petty, and Kao's (1984) scale. This scale contains statements such as, "I prefer complex to simple problems" and "Thinking is not my idea of fun" (reverse scored). Participants responded to each statement on a 7-point scale anchored at *extremely uncharacteristic of me* and *extremely characteristic of me*. Because items on this scale were highly reliable (α = .83), they were summed to form one overall NFC index. Unfortunately, due to a computer programming glitch, NFC scores were only available for the majority of the participants in the reflection groups but not for any of the participants in the no reflection groups (*N* = 222). Nevertheless, given its hypothesized value for predicting depth of processing specifically in the reflection groups (with and without feedback) and the sufficiently large sample, we included NFC in our analyses to test our hypotheses.

Learning goal orientation was measured with four 7-point scale items *(*VandeWalle, Cron, & Slocum, 2001*)* ranging from 1 (*strongly disagree*) to 7(*strongly agree*). An example item of this scale is "I truly enjoy learning for the sake of learning". Because items on this scale were highly reliable (α = .86), they were summed to form one overall learning goal orientation index.

Personal Importance. Participants received a brief definition of each of the four performance dimensions that were about to be assessed in the work simulation and were asked to rate the extent to which each was personally important to them using a 9-point scale (1= *not at all important*, 9 = *extremely important*). Although the reliability was rather low (α = .67), we summed the four items to form an overall index of importance.

Participants' perceptions of the accuracy of the feedback message (α = .80), the usefulness of the feedback provided (α = .78), and their overall satisfaction with feedback (α = .97) were measured with the same items as in Study 1. We did not measure demographic variables as all participants had the same educational level, about the same age, and little to no work experience.

Results and Discussion

Descriptive Statistics and Preliminary Analysis

Descriptive statistics and correlations between all measured variables and for all participants are reported in Table 5. Overall, the pattern of results was similar to those observed for Study 1. Specific relations between individual difference variables and dependent variables are tested and discussed in Hypotheses 3 to 5.

To check whether reflection had taken place, two independent coders again scrutinized the written texts, using the same coding system as in Study 1. The same cut-off (a score lower than the midpoint) was used. Accordingly, in the student sample, 43 participants (23 in the Feedback / Reflection condition and 20 in the No feedback / Reflection condition) were excluded from further analyses. The lower number of participants excluded in the student sample can be explained by the proctored setting of the task. As they were supervised, they might have felt more obliged to follow instructions strictly. We again present both the analysis for the total sample (ITT analysis) and for the subsample that adhered to instructions (efficacy subset analysis) separately.

Hypothesis 1

ITT analysis in the student sample replicated the results obtained in the employee sample. Planned comparisons showed that performance improvement in the Feedback / Reflection condition was higher than performance improvement in the Feedback / No reflection condition ($F(1,484) = 10.32$, $p < .01$, $d = .39$), the No feedback / Reflection condition ($F(1,484) = 124.14$, $p < .01$, $d = 1.39$), and the No feedback / No reflection condition ($F(1,484) = 113.98$, $p < .01$, $d = 1.47$). Thus, Hypothesis 1 was supported in the student sample. An ITT analysis including all participants showed that the use of reflection

combined with feedback enhanced the positive effect of feedback on performance. Again, we found that reflection without feedback did not improve performance.

As reported in Table 6, planned comparisons on the subsample that actually reflected on the feedback showed that performance improvement in the Feedback / Reflection condition was higher than performance improvement in the Feedback / No reflection condition ($F(1,432) = 19.32$, $p < .001$, $d = .55$), the No feedback / Reflection condition ($F(1,432) = 141.22$, $p < .001$, $d = 1.67$), and the No feedback / No reflection condition ($F(1,432) = 135.96$, $p < .001$, $d = 1.66$). Thus efficacy subset analysis also supported Hypothesis 1. As can be seen in Figure 2, the use of reflection combined with feedback enhanced the positive effect of feedback on performance. Again, we found a difference in effects sizes among the ITT and the efficacy subset analysis although the difference was less pronounced than in the employee sample ($d = .39$ vs. $d = .55$).

Results showed that in the No feedback / Reflection condition performance improvement among excluded participants ($M = .42$, $SD = 1.17$) was no different from that among those who completed the reflection ($M = .01$, $SD = 1.08$), indicating that reflection made little difference if participants did not receive feedback ($F(1,138) = 2.68$, $p > .10$, $d = .15$). However, in the Feedback / Reflection condition performance improvement among excluded participants ($M = .60$, $SD = 1.08$) was significantly lower than that among participants who actually completed the feedback reflection ($M = 1.82$, $SD = 1.02$), thus replicating conclusions from Study 1 that performance improvement in the Feedback / Reflection group is associated with completing the reflection instructions ($F(1,130) = 23.85$, $p < .001$, $d = 1.16$).

Similar to the employee sample, a GLM analysis with Trial as within-subjects factor and number of words as continuous independent variable, showed that the number of words was a significant predictor of performance improvement in the Feedback / Reflection condition, $F(1,110) = 3.99$, $p < .05$, $\eta^2 = .04$. Thus depth of processing was related to performance improvement for participants receiving feedback. Again, reflection was helpful only in combination with feedback, as the number of words was not related to performance

improvement in the No feedback / Reflection condition, $F(1,115) = .86$, $p > .05$. Finally, we also explored whether the reflection intervention helped all performers equally well in the student sample. We used the same procedure as in Study 1 for correcting for regression to the mean. Our results suggest that participants with a moderate ($d = 2.78$) and high ($d = 2.83$) initial performance enhanced their performance somewhat more than participants with an initial low performance ($d = 2.33$)[2].

Hypothesis 2

Hypothesis 2 predicted that the effect of reflection after feedback on performance would be partially mediated by participants' feedback reactions. We used the same procedures to test the mediating role of feedback reactions as in Study 1. Results showed that the indirect path from reflection to T2 performance when controlling for T1 performance was not significant for satisfaction ($z = -.70$, $p > .05$), accuracy ($z = 1.52$, $p > .05$), or utility ($z = .21$, $p > .05$), as indicated by the Sobel test. Thus, as in Study 1, Hypothesis 2 was not supported[2]. We also explored whether reflection moderated the effect of feedback sign on feedback reactions but found no significant effects for satisfaction ($R^2 = .01$, $p = .08$), accuracy ($R^2 = .01$, $p = .28$), or utility ($R^2 = .00$, $p = .97$), indicating that feedback reactions probably do not have a role in the reflection process.

Hypotheses 3, 4 and 5

We predicted that individual differences in need for cognition (NFC) (*H3*), learning goal orientation (LGO) (*H4*), and personal importance (*H5*) would explain the depth of processing during reflection. As in previous studies (e.g., Gordijn et al., 2001; Shiv et al., 2004), we used the number of words written down during the reflection intervention as an indication of depth of processing. As can be seen in Table 5, NFC ($r = .20$, $p < .01$), LGO ($r = .19$, $p < .01$) and importance ($r = 16$, $p < .01$) were positively and significantly related to word count. When using these variables together as independent variables in a multiple regression analysis, NFC ($b = 10.27$, $p < .05$), LGO ($b = 13.20$, $p < .01$), and personal importance ($b = 16.37$, $p < .01$) all remained independent predictors of depth of processing, explaining 10% of variance ($p < .001$) in total.

This finding also sheds some light on the curious finding in Study 1 that some employees did not follow reflection instructions adequately. When comparing the excluded group to the included group in the student sample, participants not completing half of the reflections scored lower on NFC (M = 4.60, SD = .93 vs. M = 4.97, SD=.74), LGO (M = 4.24, SD = 1.42 vs. M = 4.86, SD=1.10), and personal importance (M = 6.76, SD = .91 vs. M = 7.21, SD= .78), F (3,213) = 6.70, p < .001, η^2 = .09. Thus it seems that the reflection strategy proposed in this study may be less effective for individuals low in NFC, low in LGO and low in personal importance as they will be less inclined to write down their thoughts and thus will engage less in deep processing.

A final issue we explored is whether individuals high in NFC, LGO and personal importance also benefited more from the reflection intervention after feedback, independent of the thoughts they had written down. It might be that they not only write down more thoughts but also that they take more value from the processing of feedback itself. To this end, we conducted a GLM analysis with Task as within-person factor and LGO, NFC, and personal importance as continuous predictors and performance as dependent variable in the Feedback / Reflection condition. None of the interaction effects between the continuous variables and the within-person factor reached significance (p > .05), indicating that NFC, LGO, and personal importance were not related to stronger performance improvement after feedback for participants that had already reflected extensively on the feedback.

General Discussion

Our results are important because they provide evidence across two studies for the beneficial effect of the reflection strategy proposed. First, they demonstrate that reflection combined with feedback improved task performance more than when employees received only a feedback report. The effect size of writing down reflections combined with feedback as compared to a feedback report alone was moderate (ds = .48 and .55), indicating that reflection may be a useful intervention to enhance feedback processes in organizations. This finding takes a step toward filling the need for more insight into strategies that facilitate

feedback processes in organizations, as called for in previous research (Levy & Williams, 2004; London & Smither, 2002).

Second, we found that reflection only enhanced performance in combination with external feedback. One of the unresolved issues in the literature on reflection is whether external feedback is necessary before learning from experience is possible. Our results are informative for this debate (e.g., Mayer, 2004; Ellis & Davidi, 2005) as they seem to support the guided discovery theory 'camp' (Mayer, 2004). However, we do not claim that this study provides a definite answer to this question. The work simulation used was partly responsible for the results obtained. Participants may have had too little information upfront about what was desired behavior in this simulation to obtain a good score, whereas in real work settings they would probably have acquired more experience about appropriate behavior. In addition, our results may not be entirely inconsistent with previous studies supporting reflection without external feedback. For instance, whereas Ellis and Davidi (2005) advance after-event reviews as a guided self-explanation strategy, a key characteristic of the *after-event* review is that it takes place *after the event*. Thus participants may have had at least some initial perceptions about whether the event was successful or not (feedback). The question for future research, therefore, will be how much feedback is desirable for an optimal level of learning in reflection. More research is needed into moderators of the role of feedback in reflection in organizations. These moderators include type of feedback (no feedback vs. diagnostic feedback vs. outcome feedback), the type of task and skills (routine vs. complex tasks), and the availability of guiding information in the environment (prior knowledge, peers, role models, mission statements).

Our results are less clear regarding the intermediate processes linking reflection after feedback to performance improvement. Feedback reactions do not seem to play a major role in the reflection intervention. One explanation for this lack of effect is that perceptions of feedback may be determined early in the feedback process (e.g., Swann & Schroeder, 1995) so that interventions *after* the feedback has been provided may have little impact on perceptions and reactions. Indeed, previous research identifying variables that enhance

feedback reactions have typically focused on factors that are present before (e.g., procedural justice) or at the same time as feedback is provided (e.g., feedback format).

The question remains as to why reflection combined with feedback leads to notable increases in performance. A first explanation is that depth of processing is one of the crucial explanatory factors for the beneficial effect of a feedback message on performance. Performance improvement was related to the depth of processing occurring after feedback as indicated by the number of words written down. Depth of processing may be related to better organization of feedback information and integration in memory, making it easier to apply feedback in subsequent tasks. A second explanation for the effectiveness of combining reflection with feedback is that feedback helps to direct where the reflection should be directed. This possibility is supported by an explorative content analysis of the reflections written down with and without feedback. We found that reflections in the feedback conditions included significantly more arguments corresponding with accurate performance in the task than reflections in the conditions without feedback. A third explanation that may be addressed in future research is whether reflecting on feedback may be instrumental in enhancing self-efficacy, which in turn might lead to an increase in performance. Previous studies show that interventions making persons develop and repeat self-statements that guide performance (self-persuasion) is an effective way to increase self-efficacy and subsequent performance (Brown, 2003; Latham & Budworth, 2006).

From a practical point of view, the reflection intervention should be instrumental for aiding employee development after multi-source feedback, or computerized assessment. For instance, after employees have received a computerized feedback report, they might be asked to complete a reflection intervention from their own work station. Of course, the reflection strategy as operationalized in the current study has its limitations and may not be applicable in all feedback situations; one could envision that having to complete a web-based reflection intervention after a performance review discussion with one's supervisor might lead to unfavorable reactions. However, its use may not be limited to computerized contexts.

Giving employees an opportunity to step back and think about their experiences can take place during after-event reviews or feedback workshops.

The use of a web-based setting in the current study has a number of advantages and drawbacks. On the positive side, it demonstrates how the intervention can be easily implemented in web-based learning environments. The use of web-based and computerized feedback reports is becoming more and more common in organizations (London, 2003). In addition, a wealth of self-assessment instruments is freely available on the Internet or on an organization's Intranet. Employees who are looking for feedback on their work-related skills can complete these self-assessment instruments at their own pace and receive individual feedback reports. The design of this study corresponds closely to these new trends in actual work settings.

On the negative side, a considerable number of participants did not complete at least half of the web-based reflection instructions. Similar to participants dropping out of an experimental medical treatment due to negative side effects, it seems that our reflection intervention was less effective for some participants. Similar to medical treatment studies, we first tested Hypothesis 1 in the entire sample that started the experiment and found a significant effect of feedback combined with reflection (Intention-to-treat analysis). Thus the reflection intervention proposed was generally effective when evaluated on the initial sample randomly assigned to the conditions. When testing Hypothesis 1 in the subset of participants who strictly adhered to the intervention protocol, we found an even stronger effect size of the reflection intervention. In the second study, we were able to address this issue and provide additional insight into the factors that explain why some individuals did not closely follow instructions and do not extensively reflect on the feedback provided. Individuals low in need for cognition, low in learning goal orientation, and low in personal importance were overrepresented in the group of individuals that did not adhere to the intervention protocol. It appears, therefore, that the proposed intervention may be less useful for employees who score low on these individual differences because they engage less in reflection. This is a potential limitation of the usefulness of the reflection intervention, although it is inherent in

web-based learning environments that afford learners a high degree of control over their learning experience (DeRouin et al., 2005). The possibility that some adult learners may make choices that limit their learning is an important practical concern for training and reflection intervention designers to be aware of. Future research should pay attention to the development of interventions that are also effective for individuals scoring low on these individual difference variables.

Another promising avenue for future research is to combine the reflection strategy proposed in the current paper with other strategies aimed at enhancing feedback processes and stimulating employee development (e.g., Seifert et al., 2003; Smither, London, Flautt, Vargas, & Kucine, 2003). For instance, the proposed reflection strategy seems to especially impact on the early stages of the feedback process (e.g., understanding and processing feedback message), whereas the feedback coaching session used in Smither et al. (2003) seems to be targeting the goal-setting and planning stages of the feedback process. In a brief qualitative analysis, which we conducted of the reflections provided by employees, virtually no references to goals or plans for improvement were detected. Given the evidence supporting the value of goal-setting after feedback (Locke & Latham, 2002), combining the reflection intervention and goal-setting instructions may be a particularly strong intervention. Looking back on past behavior by means of coached reflection and looking forward to future behavior by setting goals may be the winning combination to enhance feedback interventions in organizations.

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Appendix A

Example of Feedback Report for “Coordinating” Skills

Coordinating
• **Definition**: This score indicates whether you are able to organize the activities of your co-workers and are able to allocate the necessary resources for these activities.
• **Expert:** People who score high on this skill typically give specific instructions to their co-workers. They schedule appointments and meetings to promote the productive use of time. They emphasize efficiency by establishing efficient work routines and by integrating multiple tasks.
• **Your score:** 15 / 20

Footnote

[1] We reported tables and figures on the basis of the efficacy subset analysis as this analysis provides most insight in the effectiveness of the intervention. All tables and figures based on ITT analysis were virtually the same and are available from the authors.

[2] We thank an anonymous reviewer for this insightful suggestion.

[3] For the sake of brevity, we did not report all results for these analyses. Detailed tables can be obtained from the authors.

Table 1

Descriptive Statistics and Correlations between Measured Variables in Study 1.

	M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Age	36.01	10.13									
2. Education	4.49	1.30	-.069[a]								
3. Tenure	12.12	10.26	.95**[a]	-.20**[a]							
4. T1 Performance	13.39	1.20	.10*[a]	.11**[a]	.09*[a]						
5. T2 Performance	13.95	1.48	.04[a]	.13**[a]	.02[a]	.54**[a]					
6. FB Satisfaction	4.39	1.11	-.03[b]	-.02[b]	-.03[b]	.41**[b]	.12*[b]				
7. FB accuracy	4.89	.97	-.02[b]	-.04[b]	-.01[b]	.34**[b]	.25**[b]	.44**[b]			
8. FB utility	5.62	1.16	-.00[b]	-.10[b]	.02[b]	.24**[b]	.23**[b]	.07[b]	.51**[b]		
9. Instructions completed	4.19	3.07	-.02[c]	.09[c]	-.03[c]	-.02[c]	.16**[c]	-.06[d]	.03[d]	-.01[d]	
10. Word count	60.20	58.48	.02[b]	.02[c]	.00[c]	-.00[c]	.16**[c]	-.09[d]	-.01[d]	-.01[d]	.74**[c]

Note: Samples sizes vary according to the condition: [a] *N* = 640, [b] *N* = 304 (only participants in feedback condition), [c] *N* = 381 (only participants in reflection conditions), [d] *N* = 190 (only participants in Feedback / Reflection condition). Educational level was measured on a 6-point scale with 6 being the highest educational level (Ph.D. or MBA). T1 = Task 1, T2 = Task 2. 'Instructions completed' indicates the extent to which participants completed the reflection instructions, with 8 indicating that all reflections were completed and 0 that no reflections were completed. 'Word count' refers to the number of words that were written down in total during the reflection intervention.

Table 2
Mean Performance and Standard Deviations across Groups in Study 1.

Results		Performance (*n* = 517)			
		Task 1		Task 2	
		M	*SD*	*M*	*SD*
No Feedback	No Reflection	13.44	1.22	13.46	1.45
	Reflection	13.36	1.10	13.41	1.34
Feedback	No Reflection	13.42	1.22	14.30	1.50
	Reflection	13.36	1.16	14.82	1.29

Table 3

Mean Performance Scores for Task 1 and Task 2 by Managers' Initial Level of Self-ratings in Study 1.

	Initial level of performance					
	Low (*N* = 37)		Medium (*N* = 39)		High (*N* = 35)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Task 1	11.92	.58	13.18	.24	14.21	.44
Task 2	14.17**	.98	14.98**	.93	15.59**	.94
D	1.98		2.31		.80	
Change in performance due to regression to the mean	12.75	.30	13.38	.15	14.02	.31
d corrected for regression to the mean	1.49		2.41		1.58	

Note: *d* is the effect size (i.e., the mean difference divided by the pooled within-group standard deviation). ** indicate significant mean differences between Task 1 and Task 2 on the basis of paired t-tests conducted for each of the three groups ($p<.01$)

Table 4

Mediation Analyses of Reflection, Feedback Reactions, and Task Performance in Study 1.

Mediator	Sobel test statistic	A (IV → Mediator)	b (Mediator → DV)	C (IV→DV)	c' (IV → DV; mediator controlled)
Satisfaction	1.14	-.23†	-.14†	.57**	.51**
Accuracy	0.88	.13	.14†	.57**	.12
Utility	1.59	.31*	.19**	.57**	.48**

Note. All paths are betas; *N* = 245. T1 performance was controlled for in all analyses.

† p < .10, *$p < .05$,** $p < .01$.

Table 5

Descriptive Statistics and Correlations between Measured Variables in Study 2.

	M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. T1 Performance	13.13	1.08									
2. T2 Performance	13.86	1.40	.38** [a]								
3. FB Satisfaction	3.75	1.14	.17** [b]	.11 [b]							
4. FB accuracy	4.64	.87	.16* [b]	.26** [b]	.44** [b]						
5. FB utility	5.45	1.25	.14* [b]	.19** [b]	.23** [b]	.40** [b]					
6. Instructions completed	6.60	2.51	.05 [c]	13*	.01 [d]	.14 [d]	.21* [d]				
7. Word count	134.59	71.36	-.04 [c]	.09	-.07 [d]	.26** [d]	.23* [d]	.67** [c]			
8. Learning GO	4.82	1.10	.09 [a]	.08 [a]	-.04 [b]	.08 [b]	.17* [b]	.18** [c]	.19** [c]		
9. Need for Cognition	4.92	.79	.11[e]	.16*[e]	-.14[e]	.11[e]	-.03[e]	.18**[e]	.20**[e]	.20**[e]	
10. Involvement	7.12	.79	.06 [a]	.07 [a]	-.12 [b]	.13* [b]	.20** [b]	.16** [c]	.19** [c]	.10* [c]	.11

Note: Samples sizes vary according to the condition: [a] *N* = 488, [b] *N* = 231 (only participants in feedback condition), [c] *N* = 272 (only participants in reflection conditions), [d] *N* = 128 (only participants in Feedback / Reflection condition), [e]NFC was available for 222 participants in the reflection conditions. Educational level was measured on a 6-point scale with 6 being the highest educational level (Ph.D. or MBA). T1 = Task 1, T2 = Task 2. Instructions completed reflects the extent to which participants completed the reflection instructions with 8 indicating that all reflections were completed and 0 that no reflections were completed. 'Word count' refers to the number of words that were written down in total during the reflection intervention.

Table 6

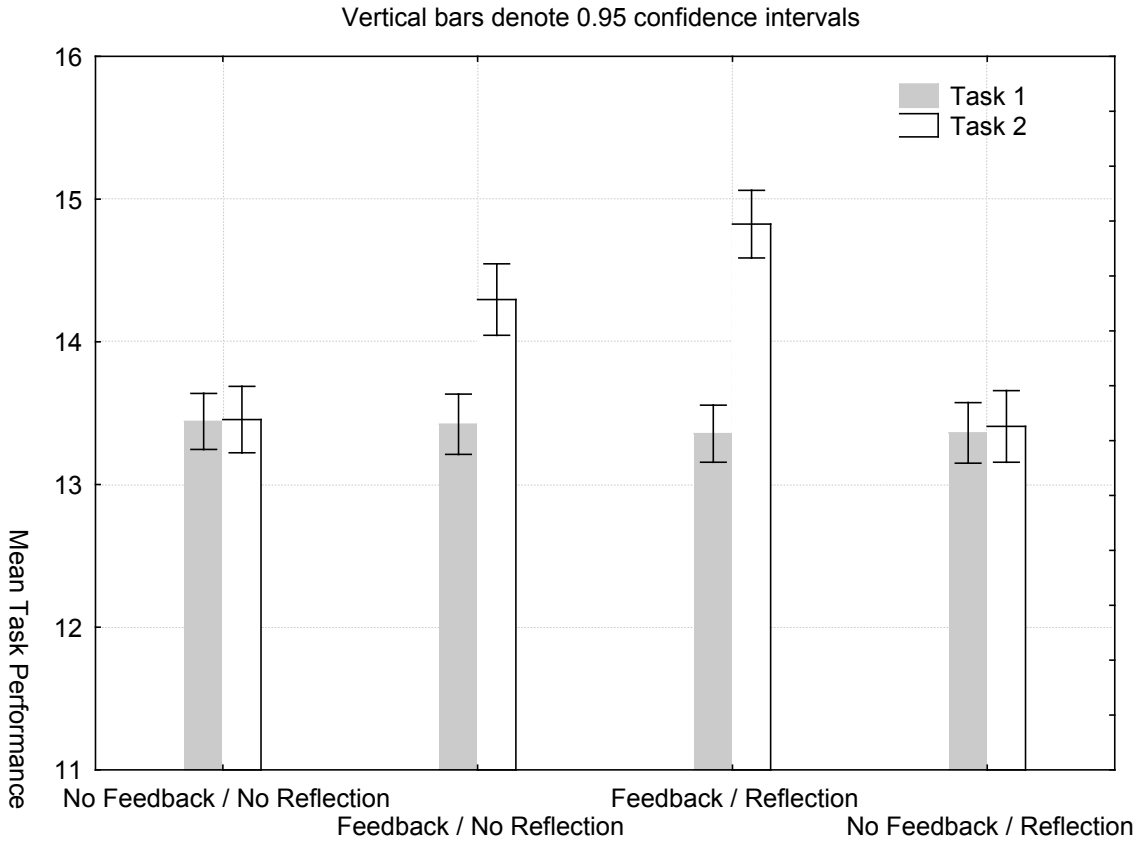
Mean Performance and Standard Deviations across Groups in Study 2.

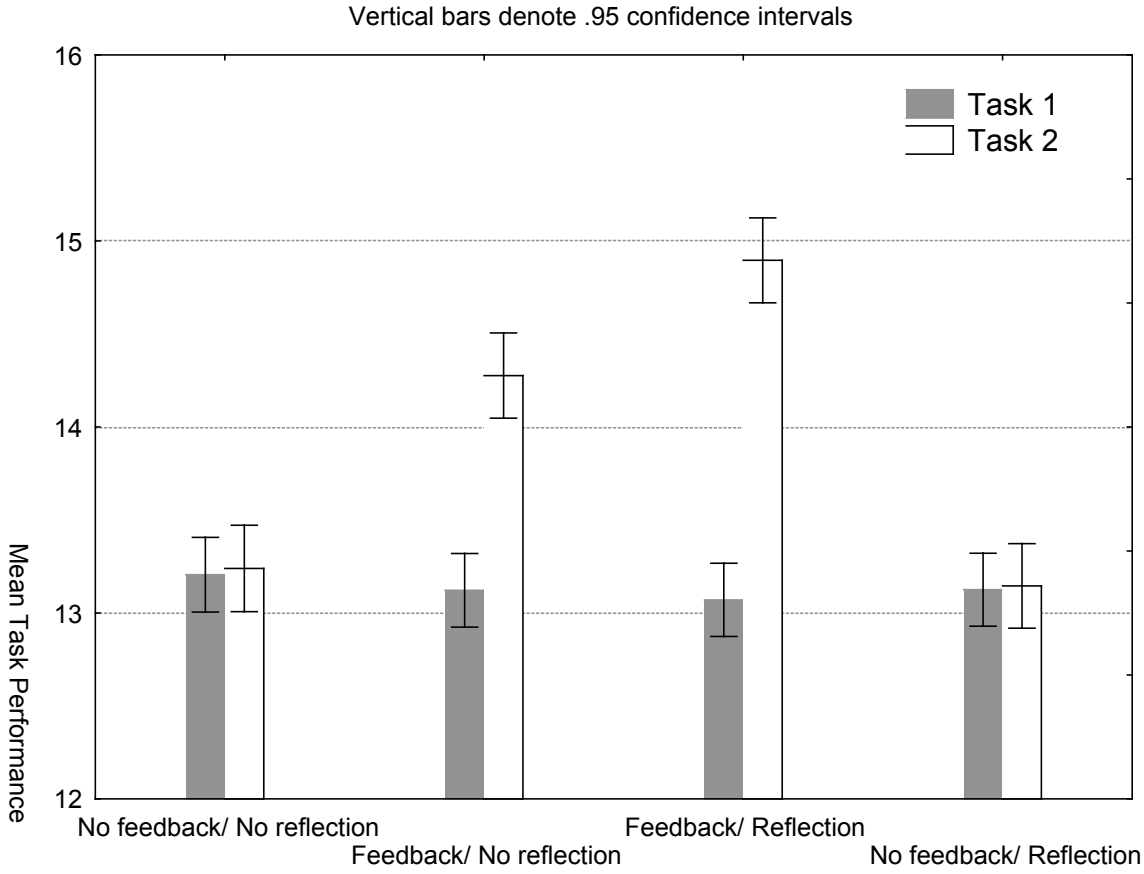
Results		Performance (n = 445)			
		Task 1		Task 2	
		M	*SD*	*M*	*SD*
No Feedback	No Reflection	13.22	1.16	13.26	1.19
	Reflection	13.15	1.06	13.16	1.13
Feedback	No Reflection	13.12	1.01	14.28	1.41
	Reflection	13.09	1.02	14.91	1.10

Figure Captions

Figure 1. Effects of reflection and feedback on task performance (Study 1).

Figure 2. Effects of reflection and feedback on task performance (Study 2).


Vertical bars denote 0.95 confidence intervals
Task 1
Task 2
Mean Task Performance
16
15
14
13
12
11
No Feedback / No Reflection
Feedback / No Reflection
Feedback / Reflection
No Feedback / Reflection


Vertical bars denote .95 confidence intervals
Task 1
Task 2
Mean Task Performance
16
15
14
13
12
No feedback/ No reflection
Feedback/ No reflection
Feedback/ Reflection
No feedback/ Reflection