The Interplay Between Self-evaluation, Goal Orientation, and Self-efficacy on Performance and Learning

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Abstract

Objective Self-awareness Theory (Duval & Wicklund, 1972) proposes that self-evaluation increases an individual's awareness of any discrepancy between their current performance and an internal goal. In the current study we prompted self-evaluation throughout an intelligence test (Analysis-Synthesis Test – AST) using confidence ratings (CR). AST performance, the extent to which participants incidentally learnt task-relevant rules (learning rules was unnecessary because they were provided), self-efficacy, and goals, were assessed. The results indicated an effect of performing CR on both performance and rule learning, but the effect depended on self-efficacy. Compared to matched controls (n=43), participants who performed CR (n=42) and had high self-efficacy performed better on the AST but learnt fewer rules. Performing CR had no effect on participants low in self-efficacy. This suggests that self-evaluation interacts with self-efficacy to modify participants' goals, specifically CR appear to shift individuals high in self-efficacy from a mastery goal to a performance goal.

Keywords: reasoning, intelligence, reactivity, goal orientation, self-efficacy

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Accurate self-knowledge is a highly valued attribute and important to everyday functioning. Awareness of our own abilities and past performance facilitates realistic goal selection and allows us to better direct our future behavior. There is some evidence that self-evaluation occurs almost continuously when we perform a demanding cognitive activity, and this self-evaluation may occur both spontaneously and unconsciously. Self-evaluation in this context is often referred to as performance monitoring or alternatively error detection. Performance monitoring is vital to learning outcomes as it allows the learner to identify errors so that they can avoid repeating them in the future (Yeung & Summerfield, 2012). Performance monitoring is also important for the effective allocation of cognitive resources (Carter et al., 1998). Accurate performance monitoring is central to an individual's ability to regulate their own cognitive behavior (Nelson & Dunlosky, 1991) and, in particular, effectively make decisions about study time (e.g. Metcalfe & Finn, 2008; Son & Metcalfe, 2000). Furthermore, learners need to continually evaluate the effectiveness of different study activities on their learning in order to select the best possible study behaviors (Flavell, 1979).

Given the importance of accurate self-knowledge, individuals such as students and employees are often encouraged to self-reflect and self-evaluate their performance so that they can better identify their strengths weaknesses and detect issues or errors (Carver & Scheier, 2001). However, there is little direct evidence that self-evaluation leads to more accurate self-knowledge (Silvia & Gendolla, 2001). Indeed, self-assessment is often systematically inaccurate and flawed, which can often lead to negative outcomes and ineffective decision making (Dunning, Heath, & Suls, 2004). Objective self-awareness theory (OST; Duval & Wicklund, 1972, 1973) contends that self-focused attention does not necessarily lead to accurate self-knowledge, instead it directs individuals' attention to discrepancies between their current performance or behavior and their internal standards or goals (Silvia & Duval, 2001), referred to here as *goal discrepancies.* OST theory argues that when an individual becomes aware of a goal discrepancy, they either modify their behavior to bring it in line with their goal, modify their goal, or disengage from the activity, which reduces their awareness of the goal discrepancy (Silvia & Duval, 2001). For example, upon reflecting on their studying, a student may determine that they have not been working hard enough to prepare for an upcoming exam, which may lead them to study more or set a more modest goal for the exam, alternatively they may try to distract themselves to avoid thinking about studying for the exam.

Which of these three strategies an individual adopts is largely determined by their self-efficacy, if an individual has high self-efficacy they will believe that they can improve their performance to match their goal and will act accordingly, whereas individuals low in self-efficacy may lower their goals or disengage from the task because they do not believe they can implement the necessary improvements in their performance. We can conceptualize these expected changes in terms of the goals we expect participants to adopt. We hypothesize that self-evaluation will lead high self-efficacy participants to focus on improving their performance, whereas low self-efficacy participants will either disengage from the task or lower their goal, both of which are likely to impair their performance on the task. These hypotheses therefore relate to changes in a participants goal orientation.

Goal orientation is a well-studied concept that broadly concerns the distinction between mastery goals that concern development, improvement, and learning compared with performance goals which prioritize performing well and demonstrating ability (VandeWalle, 1997). Generally speaking mastery goals are considered advantageous for a range of outcomes including academic engagement (Ames & Archer, 1988; Pintrich, 2000; Wolters, 2004), job performance (Janssen & Van Yperen, 2004; VandeWalle, Brown, Cron, & Slocum Jr, 1999), and cognitive ability (Eison, 1981). Although some have conceptualized goal orientation as a trait or at least a quasi-trait like concept (DeShon & Gillespie, 2005), goal orientation is domain specific and can equally be considered as state-like (VandeWalle, Cron, & Slocum Jr, 2001). The goal orientation that an individual selects for a particular situation is somewhat determined by an individual's self-efficacy (Diseth, 2011). Individuals with high self-efficacy tent to pursue their goals with more effort and endeavor to develop from the experience of goal pursuit (DeGeest & Brown, 2011). Given this, a number of studies have expectedly shown a positive relationship between high self-efficacy and mastery goal orientation (Bell & Kozlowski, 2002; Diseth, 2011).

H1: In the control group (without self-evaluation), high self-efficacy participants will display mastery goal orientated behavior, whereas low self-efficacy participants will show performance goal orientated behavior.

The rationale behind encouraging self-evaluation in schools and workplaces has often been that they will elicit greater effort and goal driven behavior. However, as previously mentioned, when an individual becomes aware of a goal discrepancy they can either change their behavior or alternatively they can modify their standard/goal. With regards to modifying a goal, this may occur quantitatively (e.g. changing from a goal of a 75 on an exam to a 65) or qualitatively changing the nature of the goal (e.g. changing from try to master the material in a class to focusing on passing the exam). Based on this OST framework we expect that self-evaluation will lead participants with high self-efficacy to shift to a performance orientation in order to improve their performance and reduce the goal discrepancy. As previously stated, participants with low self-efficacy are likely to naturally adopt a performance goal-orientation and therefore self-evaluation should have little effect on the goal-orientation they adopt.

There is some previous evidence that self-evaluative prompts lead to such changes in goal orientation. A recent study by Mitchum, Kelley, and Fox (2016) using a word-pair learning paradigm found that, if the list of word-pairs participants were learning contained both difficult and easy items, then performing judgments of learning (i.e. rating how likely it is that they will recall a word-pair on a later test) resulted in participants spending more of their study time on the easier items rather than the difficult items. This resulted in participants who performed judgments of learning recalling fewer word-pairs on a subsequent test. The authors suggested that in the presence of both easy and hard items, judgments of learning make participants aware of the fact that they will inevitably fail to remember all of the words on the list, so they adopt a performance orientation rather than a mastery orientation and over study the easier items.

H2: Self-evaluation will result in participants adopting a performance goal orientation, regardless of their level of self-efficacy

In the current study we induce self-focused attention by asking participants to self-evaluate their performance after each item on an intelligence test, by providing confidence ratings (CR). CR direct participants' attention to their current subjective belief in their performance by require participants to reflect on, evaluate, and quantify their performance. A previous study which examined the effects of eliciting confidence ratings from participants while they completed an intelligence test found that participants who provided CR, performed better than participants who performed the task without providing ratings (Double & Birney, 2017). Crucially, a subsequent experiment showed that this effect depended on the confidence/self-efficacy of participants, with CR facilitating the performance of high self-confidence participants but hindering the performance of low self-confidence participants.

H3: Performing CR will facilitate performance in high-self-efficacy participants and impair performance in low self-efficacy participants

In the current experiment participants completed a deliberately difficult task so that they would be likely to experience a performance discrepancy when they self-evaluated their performance. Of primary interest is whether this self-evaluation causes participants to improve their performance and/or change their goal orientation.

Method

Participants

A community sample of 85 participants (80% female) was recruited using an advertisement placed in a newsletter of the Australian Broadcasting Corporation as part of a research partnership with the University of Sydney (M_{age} =

63.75, SD = 9.83). Participants received no remuneration for participating in the study. Participants were randomly allocated to the confidence ratings group (CR group; $n = 42$) or a control group that did not provide confidence ratings (No-CR group; $n = 43$).

Materials and procedure

Participants completed the following measures online from their own personal computers using Qualtrics (Qualtrics, 2015) and Inquisit (Inquisit, 2016). All materials were programmed to display in a standardized fashion.

Analysis Synthesis Task (AST; Woodcock, McGrew, Mather, & Schrank, 2001): A modified computerized version of the AST tasks was performed by participants. The AST task requires participants to solve problems by combining a series of tiles using a set of simple rules (e.g. a red triangle and purple square make blue circle). The rules are displayed continuously in the form of a key at the top of the screen. Figure 1 presents a typical question. One tile is blank and participants must decide which tile correctly fills the blank. Participants could combine any two tiles that are next to each other either horizontally or vertically.

As the task was expected to be difficult for a community sample, participants were given a series of practice items and were allowed to continue to practice until they felt they were ready to progress to the test phase (minimum of 12 practice items, maximum 36). The test block consisted of 20 items that were approximately ordered according to their difficulty. There were 5 rules in each of the practice and test blocks (different rules/stimuli were used in the practice and test phases).

Participants in the CR group were asked to rate their confidence that they answered the previous item correctly using a scale from 0-100%. In order to reduce any response time effect on performance, participants in the control group were shown a blank screen for 2000ms after each trial.

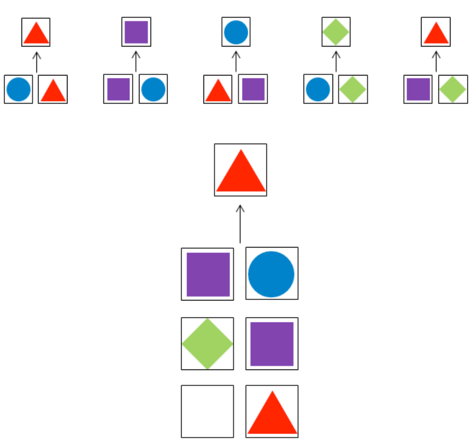

Figure 1: A typical question drawn from the AST task. that were used in the test block.

Self-efficacy: As self-efficacy is domain specific we used a particularly proximal measure of self-efficacy by having participants predict their score on the test block as a percentage after completing the practice block.

Rule Recall Test: After finishing the test block participants unexpectedly performed a recall test of the rules Participants had been given no prior warning that they would need to recall the rules on the later task and it was not necessary that participants memorize them as they had been displayed on the screen continuously during the AST task. The recall test asked participants questions such as "what color is the combination of the red triangle and blue circle?".

Results

All data analysis was performed using R version 3.2.3 (R Core Team, 2015). Table 1 presents summary statistics for key study variables. The number of practice trials performed did not differ significantly between the CR group and the No-CR group, $F(1,83) = .17$, $p = .683$. Participants' initial predictions of their performance did not differ significantly between the CR group and the No-CR group, $F(1,83) = .002$, $p = .967$.

Table 1: Descriptive statistics for key study variables.

Variable	N	*M*	SD
Predicted performance	85	31.5	21.7
Number of practice trials	85	23.1	9.7
AST practice score	85	10.6	4.9
AST test score	85	10.3	2.7
Rules recalled	74	2.2	1.7

AST Performance

Performance was analyzed using a linear regression model with number of correct items as the criterion variable. Experimental group and self-efficacy were entered as predictors along with the relevant interaction. In addition, as we were primarily interested in the moderating effect of self-efficacy, over and above ability, we included participants' practice scores and number of practice trails as covariates. Overall there was no main effect of experimental group, $\beta = .08$, $t(79) = .89$, $p = .378$. Self-efficacy was a significant negative predictor of performance, $\beta = -.27$, $t(79) = 2.02$, $p = .047$. Practice score and practice trial count were both positive predictors of test performance; $\beta = .68$, $t(79) = 7.19$, $p < .001$ and $\beta = .35$, $t(79) = 4.03$, $p < .001$ respectively. Crucially, the group X predicted performance interaction was a significant predictor of test performance, $\beta = .27$, $t(79) = 2.07$, $p = .042$, see Figure 2.

A simple slopes analysis indicated that self-efficacy was a significant negative predictor for the No-CR group, $\beta = -.18$, $t(79) = 2.02$, $p = .047$, but not a significant predictor of performance for the CR group, $\beta = .06$, $t(79) = .74$, $p = .464$.

As shown in Figure 2, participants with high self-efficacy performed better in the CR group than the NO-CR group, whereas there was no group difference for participants with low self-efficacy.

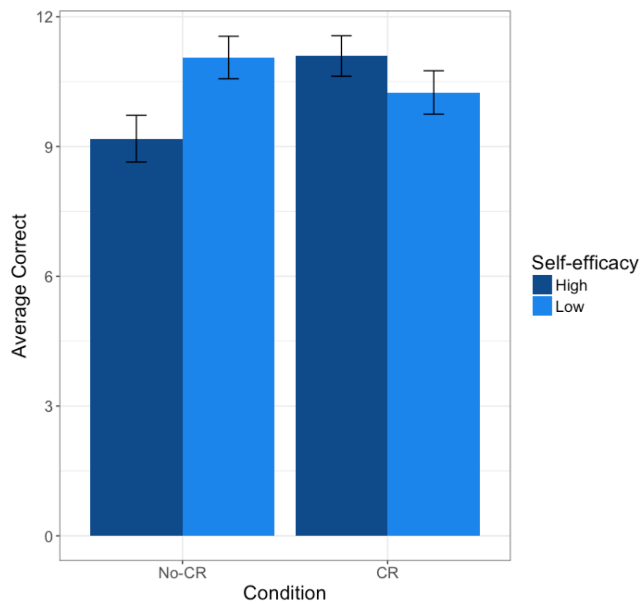

Figure 2: Average number of correct items on the analysis synthesis task as a function of experimental group and predicted performance. The values used for high and low predicted performance are 1 standard deviation above and below the mean respectively. Error bars represent ± 1 standard error of the mean.

Rule Recall

11 participants did not complete the rule recall test and were therefore excluded from the analysis. Rule recall was analyzed using a second linear regression with number of correctly recalled rules as the criterion variable.

Experimental group, self-efficacy, and the interaction between the two were entered as predictor variables. In addition, to control for performance on the analysis synthesis task, AST test performance was entered as a covariate. Again there was no significant main effect of experimental group, β = -.16, $t(69) = 1.54$, $p = .128$. Self-efficacy and AST performance were both significant positive predictors of rule recall performance, β = .47, $t(69) = 2.94$, $p = .004$ and β = .33, $t(69) = 3.03$, $p = .003$ respectively. Again the hypothesized group X self-efficacy interaction was significant, β = -.36, $t(69) = 2.25$, $p = .028$, see Figure 3. Simple slopes analysis indicated that self-efficacy was a significant positive predictor of recall performance for the No-CR group, β = .31, $t(69) = 2.94$, $p = .004$, but not for the CR group, β = -.01, $t(69) = .11$, $p = .911$. As shown in Figure 3, participants with high self-efficacy in the No-CR group outperformed all other groups in terms of rule recall.

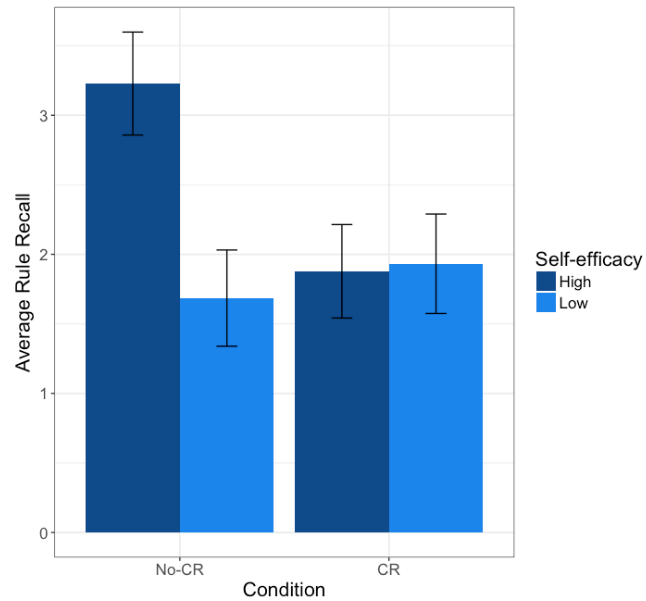

Figure 3: Average number of rules recalled as a function of experimental group and predicted performance. The values used for high and low predicted performance are 1 standard deviation above and below the mean respectively. Error bars represent ± 1 standard error of the mean.

Discussion

Self-evaluation is often assumed to be an effective method to obtain accurate self-knowledge about one's abilities and performance. Organizations and educators often pursue formal and informal opportunities for feedback and evaluation, such as performance reviews, testing etc. These procedures may have many benefits such as improving communication, identifying ongoing issues, and providing feedback. However, in terms of the effect of self-evaluation on performance the current results reveal two important caveats in determining whether there is a benefit to performance/learning outcomes as a result of self-evaluation. The first is the importance of self-efficacy, our results show that self-evaluation improved the performance of participants with high self-efficacy but had no effect on participants with low self-efficacy. The second finding of note is that the effect of self-evaluation may depend on the nature of the outcome you are assessing. For participants high in self-efficacy, self-evaluation improved performance but impaired incidental learning, whereas there was no effect on either outcome for low self-efficacy participants.

According to OST, self-efficacy moderates the way in which we behave when confronted with goal discrepancies. The theory suggests that when high self-efficacy participants are confronted with goal discrepancies they work to improve their performance, whereas low self-efficacy participants may disengage from the task (thereby reducing awareness of the goal discrepancy). Our results conform to this general pattern with high self-efficacy participants improving their performance in response to CR and low self-efficacy participants obtaining no benefit. This is in keeping with the previous finding by Double and Birney (2017), who demonstrated that performing CR during Raven's Progressive Matrices improved the task performance of high-confidence participants and impaired the performance of low-confidence participants. Our results have similarly found an asymmetry in the effect of CR on performance as a function of self-efficacy. Although we found no evidence of impaired performance in low self-efficacy participants, our results demonstrated that CR were beneficial only to participants high in self-efficacy. The difference in findings between this and Double and Birney (2017) in terms of low self-efficacy participants needs further exploration but may be a result of differences in how self-efficacy/self-confidence was assessed or the nature /difficulty of the task.

The current results suggest that high self-efficacy participants ordinarily adopt a mastery goal orientation, but shifted to a performance orientation when asked to perform CR. The finding that high self-efficacy participants tend to adopt a mastery goal is in keeping with the established relationship between goals and self-efficacy (Bell & Kozlowski, 2002; DeGeest & Brown, 2011; Diseth, 2011). Importantly, to our knowledge the results of the current study are the first to show that self-evaluation prompts high self-efficacy participants to adopt a performance orientation, which benefits performance but hinders incidental learning. When individuals high in self-efficacy are made aware of goal discrepancies they are likely to be motivated to reduce that discrepancy by attempting to improve their performance (Silvia & Duval, 2001). The current results indicate that this focus on performance may come at the cost of a shift away from learning in line with the classic goal orientations paradigm (VandeWalle, 1997). It may be that, as a result of the evaluative nature of CR, they prompt high self-efficacy participants to direct attention to task relevant information and ignore task-irrelevant (rule) information. This suggests that appropriateness of using self-evaluation may depend on the outcomes of interest. In classrooms and workplaces self-evaluation has often become commonplace, but this may be problematic given the current body of evidence suggesting that a mastery orientation has many relative advantages in such settings (Janssen & Van Yperen, 2004; Pintrich, 2000; Wolters, 2004). Although self-evaluation may be beneficial, the current results indicate that both self-efficacy and whether the valued outcomes are learning or performance based need to be considered before advocating self-evaluation.

Metacognitive interventions are often encouraged in the education literature and have obtained some positive results (Berardi-Coletta, Buyer, Dominowski, & Rellinger, 1995; Desoete & Roeyers, 2006). The current results, however, raise the possibility that such interventions are selectively benefiting students with high self-efficacy. Metacognitive prompts encourage individuals to monitor and evaluate their performance. Although the metacognitive literature has argued that such behaviors are important for error monitoring, strategy selection and allocating cognitive resources, such behaviors also induce self-focused attention and may have an interactive effect with self-efficacy. Metacognitive prompts encourage individuals to monitor and evaluate their performance but do not necessarily provide a framework for doing so accurately. Although individuals are generally able to monitor their performance effectively, there are significant individual differences in the accuracy of such monitoring. It may be that in the current study, participants' evaluations of their own performance were shaped by their self-efficacy (i.e. high self-efficacy participants were likely to evaluate their performance positively and vice versa) and as such self-evaluation may reinforce existing beliefs in ability and thereby benefit only those who have a positive view of their own ability.

The current study has provided evidence that self-evaluative practice interact with self-efficacy to affect performance and incidental learning in an intelligence test. Given that self-evaluation is widely encouraged in both schools and workplaces, these results provide much needed research into the factors that affect the benefits of self-evaluation. The current results suggest that self-evaluation is beneficial to the performance of high self-efficacy individuals, but impairs incidental learning, most likely as a result of encouraging such individuals to adopt a performance goal orientation. For individuals low in self-efficacy, however, self-evaluation appears to have no effect on either their performance or learning outcomes.

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