The role of performance feedback on the self-efficacy performance relationship

Beattie, S.J.; Woodman, Tim; Fakehy, M.; Dempsey, C.J.

Sport, Exercise, and Performance Psychology

DOI:
10.1037/spy0000051

Published: 26/10/2015

Other version

Running head: SELF-EFFICACY AND PERFORMANCE

The role of performance feedback on the self-efficacy performance relationship

Stuart Beattie[1], Tim Woodman[1], Mohammed Fakehy[2] and Chelsey Dempsey[1]

1 Bangor University, Gwynedd, UK

2 King Saud University, Riyadh, Saudi Arabia[1]

Date of submission:

Article accepted for publication (03/09/2015) in Sport, Exercise, and Performance Psychology

Abstract

We report three studies of the moderating role of performance feedback upon the reciprocal within-person relationship between self-efficacy and performance. Participants in Study 1 received either very little feedback (current trial performance) or a wider range of previous performance markers (baseline performance and current trial performance) before making efficacy judgements. Study 2 extended from Study 1 by providing participants with a self-efficacy measure that allowed a more detailed review of past performance within the actual measure. Study 3 applied the methodology from study 1 and 2 into a task where negative self-efficacy effects have been prevalent (i.e., golf putting). Results revealed that performance feedback moderated the self-efficacy and performance relationship in that, self-efficacy was slightly negatively related to subsequent performance when minimal performance feedback was presented but positively related to subsequent performance when higher levels of performance feedback were provided. Studies 2 and 3 further confirmed the hypothesis that performance feedback moderates the relationship between self-efficacy and subsequent performance. Results from both studies suggest that task feedback may be a partial explanation of when self-efficacy has positive, negative, or no relationship with subsequent performance.

[1] This author collected data on study 2 and 3 as part of his requirements in fulfilling his PhD at the School of Sport,

Keywords: self-efficacy, feedback, negative, positive, moderation

Although effective human functioning requires the requisite skills to perform actions, one must also have the efficacy beliefs to use such skills (Bandura, 1997). Bandura's (1977) self-efficacy theory has been used to predict behaviour by assessing individuals' personal judgement in their ability to perform at specific levels of performance. Bandura (1997) states that self-efficacy is an antecedent of goal acceptance, resource commitment and performance. In Bandura's (1977, 1986) original model self-efficacy beliefs are drawn from four major sources: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states.

As Bandura (1997) notes, mastery experiences are the most influential source of self-efficacy. Further, a reciprocal relationship exists between self-efficacy beliefs and performance where the better people perform, the more efficacious they become. In turn, increased efficacy beliefs leads one to engage with more difficult goals and tasks, hence increasing subsequent performance levels (e.g., Chase, 2001; Escarti & Guzman, 1999; Waung, MacNeil, & Vance, 1995). A spate of meta-analyses conducted across various disciplines have shown strong positive effects between self-efficacy and performance (e.g., Moritz, Feltz, Fahrbach, & Mack, 2000; Multon, Brown, & Lent, 1991; Orbell, Johnston, Rowley, Davey, & Espley, 2001; Sherer et al., 1982; Stajkovic & Luthans, 1998; Woodman & Hardy, 2003). At the between person level of analysis, more than 93% of studies have found positive correlations between self-efficacy and performance (Sitzmann & Ely, 2011; Stajkovic & Lee, 2001).

Health and Exercise Sciences, Bangor University.

However, over the past decade a number of researchers have questioned the use of between person correlational studies when examining the self-efficacy and performance relationship (e.g., Beattie, Lief, Adamoulas, & Oliver, 2011; Richard, Diefendorff, & Martin, 2006; Vancouver & Kendal, 2006; Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001; Woodman, Akehurst, Hardy & Beattie, 2010; Yeo & Neal, 2006). As self-efficacy is a theory about *self*-beliefs, then self-efficacy research should be conducted at a within person level of analysis. However, even at this level of analysis it has also been proposed that self-efficacy can in some cases have a negative relationship with performance (Vancouver et al., 2001; 2002).

One reason for the negative self-efficacy effect relates to goal discrepancy. That is, an increase in self-efficacy typically allows one to set more challenging goals, which creates a goal discrepancy. However, if individuals believe they are making more progress than is necessary to meet such goals (due to high efficacy beliefs) then they may reduce their efforts in terms of goal pursuit. Consequently, according to Powers (1973, 1991) individuals with high self-efficacy may invest less effort in achieving their goals than individuals with low efficacy beliefs. While testing such a proposition, Vancouver et al. (2001; 2002) found a negative relationship between self-efficacy and performance across 4 studies using an analytical task at a within person level of analysis.

Numerous studies have further tested Vancouver et al.'s (2001; 2002) initial research findings. In short, a recent meta-analysis on the within person self-efficacy and performance relationship (Sitzman & Yeo, 2013), found that out of 38 published and unpublished studies, one third revealed null effects, one third revealed negative effects, and one third revealed positive effects between self-efficacy and performance. It is thus clear that the relationship between self-

efficacy and performance is not best explained as a main effect and it is incumbent on researchers to search carefully for theoretically meaningful moderating variables.

Recent research attention has started to examine moderating variables that may explain *when* there is a negative self-efficacy effect. For example, Schmidt and DeShon (2009) tested the relationship between self-efficacy and performance by the degree of prior success or failure on a current task (mastermind task; Vancouver et al., 2001). They reported that following poor or substandard performances, self-efficacy had a positive effect upon subsequent performance. In contrast, self-efficacy was negatively related to subsequent performance when participants followed a more successful prior performance. Therefore, it seems that following successful performance, high levels of self-efficacy may lead to complacency and effort may be withdrawn due to one's beliefs that performance levels may be easily maintained (see also Woodman et al., 2010).

Schmidt and DeShon (2010) further examined the moderating effect of performance ambiguity, which was manipulated by telling or not telling participants how many solutions there were to an anagram task. They found that self-efficacy had a negative effect upon subsequent performance when the task was high in ambiguity, and a positive effect when the task was low in ambiguity.

However, another form of task ambiguity may more readily explain some of the negative effects shown in previous research, namely performance feedback. As stated, self-efficacy theory posits that mastery experiences produce stronger and more generalized beliefs than other sources of efficacy (Bandura, 1997). However, in the majority of research examining the within-person self-efficacy and performance relationship, information about how well participants perform across trials is not presented (e.g., Beattie, Fakehy, Woodman, 2014; Beattie et al., 2011; Richard

et al., 2006; Schmidt & Deshon, 2009; Seo & Ilies, 2009; Vancouver et al., 2001; 2002; Vancouver & Kendall, 2006; Yeo & Neal, 2006). If information regarding how well one has performed on previous trials is withheld, then this forms another level of ambiguity. For example, Bandura (1997) stated that if individuals cannot monitor their performance "they are at a loss to know what skills to enlist, how much effort to mobilize, how long to sustain it, and when to make corrective adjustments in their strategies" (p. 66). This in part may explain why self-efficacy has been shown to have limited effects upon subsequent performance in some of the studies reported above. Hence, in order to make a more detailed informed self-efficacy judgement in relation to improving upon previous performances, it would be prudent to provide participants with a wider knowledge of previous performances. Therefore, the purpose of study 1 was to examine the possible moderating effect of performance feedback upon the self-efficacy performance relationship.

A further form of ambiguity exists in the way that self-efficacy has previously been measured. In previous studies noted above (and that of study 1) participants are only asked to rate their efficacy beliefs with how well they can perform on their next trial. This ignores a wealth of information (e.g., previous performances) that may be available to the participant if they do not use a reference point upon which to improve. Therefore, study 2 used a different measure of self-efficacy where self-efficacy beliefs were based upon improving from a baseline performance.

As study 1 and 2 used race car simulation and lap times as a measure of performance, study 3 used the methodological approach from study 1 and 2 and applied it to a different performance setting, where negative and non-significant effects of self-efficacy upon performance have been prevalent (i.e., golf putting; Beattie et al., 2011; 2014). As such, we could

further test the external validity from study 1 and 2 into a setting where self-efficacy has been shown to have a negative, albeit weak, relationship with subsequent performance.

To return to Study 1, half of the participants received performance feedback in relation to their current trial before making a self-efficacy judgement (replicating previous studies; e.g., Beattie et al., 2011; Vancouver et al., 2001, 2002). The other half of the participants were provided with three practice laps on the experimental race track where a baseline level of performance could be used as an additional source of information to monitor progress. Participants were reminded of this baseline performance level and their current performance level before they completed the self-efficacy questionnaire. It was hypothesised that self-efficacy would have a negative relationship with subsequent performance when performance feedback was low but a positive effect upon subsequent performance when performance feedback was higher.

Study 1

Participants

Eighty-seven participants (62 men and 25 women, M_{age} = 22.44, SD = 3.91) completed the study. As a driving simulator task was used, all participants were required to have either no or minimum exposure to driving simulator games (i.e., play less than 2 hours per week). After ethical approval, all participants gave informed consent prior to participating in the study.

Measures

Self-efficacy. To replicate the methodology used by previous researchers (e.g., Vancouver & Kendall, 2006; Vancouver et al., 2001, 2002) we asked participants to compete a single-item self-efficacy magnitude response by asking them to indicate the race time that they thought they could achieve in their next trial. Self-efficacy strength was recorded by asking participants to rate

their degree of confidence in their ability to achieve that time (on a scale of 0-100%). Self-efficacy magnitude and strength were used in all subsequent analyses. Reliability estimates for self-efficacy magnitude and strength were .96 and .88, respectively.

Performance

The number of seconds that a participant took to complete two laps of a designated race track from a rolling start was used as the dependent variable. The rolling start was a default set by the game. Participants took control of the car about 20 seconds before the start/finish line where the timer started upon crossing the line and stopped 2 laps later. No other racing cars were on the track.

Apparatus

The driving task was undertaken in a driving simulator incorporating a Logitech G25 game seat, steering wheel, pedals and gear shift lever set. The game console used was a PlayStation 3 displayed on a Hewlett Packard w2207h LCD –TFT 22-inch widescreen TV. The game used was Grand Turismo5. Approximately half the participants used racing track 2 (Super Speed Way track) as a warm up track with competitive laps occurring on race track number 3 (Fuji Speed Way track). The other half of the participants used track number 3 (Fuji Speed Way track) only. The experimenter was present at all times.

Procedure

Participants attended one session where they were briefed on the study details and provided informed consent. In both conditions, the experiment consisted of 10 trials: 3 practice trials and 7 experimental trials. Each trial in both conditions consisted of 2 laps.

In the low feedback condition, to avoid gaining previous performance experiences, track number 2 (Super Speed Way track) was used as a practice track; it is a simple oval track that is

relatively easy to drive. Participants were introduced to, and completed, the self-efficacy questionnaire after their first and second practice trials. After completion of the practice session participants competed on the more difficult racing track (Fuji Speed Way). After completing the first experimental trial, participants were made aware of their current race time and completed the self-efficacy questionnaire.

In the high feedback condition, in order to gain some experience upon which to base efficacy judgements, participants had 3 practice trials on the same track that the experimental trials were on (race track number 3; Fuji Speed Way track). Participants were introduced to, and completed the self-efficacy questionnaire after their first and second practice trials. Further, before participants completed the self-efficacy questionnaire in the experimental condition, they were reminded what their best baseline performance time was and their time on the trial that they just completed.

Across both conditions, this procedure was replicated until all 7 trials were completed. In order to maintain motivation throughout the task, a £50 cash prize was offered to the person with the fastest overall trial time.

Results

Pearson Product Moment correlations were conducted to examine the between-person relationship between self-efficacy and subsequent performance. Self-efficacy magnitude had a significant positive relationship with performance ($r = .87$, $p < .001$). In other words, the more participants believed they could improve, the better they performed. Self-efficacy strength was not significantly correlated with performance ($r = -.02$, $p = .60$; see Table 1 for means, standard deviations and bivariate correlations).

To examine the within-person level effects, Hierarchical Linear Modelling (HLM; Bryk & Raudenbush, 2002) Version 7 was used. Group mean centering was used for all level 1 variables. To examine the proportion of variance accounted for across the level 2 units (i.e., participants) intraclass correlations (ICC) were calculated. The ICC for performance, self-efficacy magnitude and strength were .82, .80 and .47, respectively. This indicated that 47% – 82% variance of the variables of interest was accounted for across participants.

Due to the high feedback condition having 3 extra laps on the experimental track over the low feedback condition, between groups differences on race time were examined. However, no significant difference across the conditions on race time occurred (γ_{01} = -4.29, p = .13). With regard to the within-person effects, race times significantly decreased (improved) over the 7 trials (γ_{10} = -1.75, p < .001). Self-efficacy magnitude and strength also reduced across trials (γ_{10} = -2.23, p < .001; γ_{10} = -1.42, p < .001); that is, as the participants become more skilled at the task, their perceived room for improvement (self-efficacy) reduced. After controlling for trial and previous performance, self-efficacy magnitude was not related to subsequent performance (γ_{30} = .-.07, p = .42). However, self-efficacy strength was related with subsequent performance (γ_{30} = .08, p <.001). That is, the more confident participants were of improving upon their present trial, the worse they performed (i.e., race times increased).

Finally, there was a significant feedback condition interaction for self-efficacy magnitude (γ_{31} = -.38, p < .001) but not for strength (γ_{31} = .06, p = .15). Specifically, as hypothesized, in the low feedback condition, self-efficacy was negatively related to race time (i.e., as self-efficacy magnitude increased, race time got worse). However, in the high feedback condition, self-efficacy had a positive relationship with race time (i.e., as self-efficacy magnitude increased, race times improved; see Table 2 and Figure 1). To follow up the interaction, separate analyses were

conducted for each condition. In the low feedback condition, self-efficacy was not significantly related to performance (γ_{30} = .09, p = .26). In the high feedback condition, self-efficacy had a marginal but significant negative relationship with performance (γ_{30} = -.29, p < .05).

Discussion

The purpose of Study 1 was to examine the moderating effects of performance feedback upon the within person self-efficacy and performance relationship. The main hypothesis was supported in that in the low feedback condition, self-efficacy had a negative (but not significant) relationship with performance. In the high feedback condition, self-efficacy had a significant and positive relationship with subsequent performance. This finding supports previous research that links performance ambiguity (or lack of performance feedback) with the negative self-efficacy and performance relationship (e.g., Schmidt & DeShon, 2010).

However, as mentioned, self-efficacy was assessed in a way that may form another level of ambiguity. That is, the efficacy measure only asks participants to rate what they perceive they can do on a subsequent trial. Not only does this measure ignore previous performance accomplishments, it only assesses self-efficacy on one level of magnitude (i.e., *what can you do on your next trial?*). This may further explain the discrepancy in the results between the magnitude and strength. If however, the self-efficacy measure included a more hierarchical structure with specific reference to potential improvement on previous performance (e.g., Beattie et al., 2011; 2014), and within a high performance feedback condition, then self-efficacy should be strongly and positively related to performance, which would confirm and extend the findings from Study 1. Thus, the hypothesis for Study2 was that a stronger positive effect between self-efficacy and performance would occur compared to Study 1.

Study 2

Participants

Forty-four participants (38 men and 6 women, M_{age} = 24.10, *SD* = .85) completed the study. Participation requirements were identical to Study 1.

Measures

Self-efficacy. Self-efficacy was assessed by asking participants how well they could improve on a baseline level of performance on a hierarchical scale. That is, if a participant's baseline performance was 320 seconds, the self-efficacy questionnaire asked participants to report how many seconds they believed they could reduce that time by. Self-efficacy magnitude was assessed in 30 one-second intervals by asking participants to answer with a *yes* or *no* response to the statement, "I am confident in my ability to reduce my baseline time by one second" to "I am confident in my ability to reduce my baseline time by thirty seconds". Thirty seconds was used as a reference point as no one in Study 1 improved by greater than 30 seconds. Self-efficacy strength was recorded by asking participants to rate the degree of confidence that they had indicated with a *yes* on the magnitude measure from 0-100%. Thus, a participant could record a total self-efficacy strength score between 0 and 3000. Before completing the self-efficacy measure, participants were made aware of their present race time performance and reminded of their baseline time. Therefore, the self-efficacy measure took the baseline performance as a reference of performance improvement. Reliability estimates for self-efficacy magnitude and strength were .70 and .65, respectively.

Performance

Performance was measured in an identical fashion to that of Study 1.

Apparatus

The apparatus was the same as in Study 1.

Procedure

The procedure was identical to that of the high feedback condition in Study 1.

Results

We used Hierarchical Linear Modelling (HLM; Bryk & Raudenbush, 2002) Version 7 in the same way as in Study 1. The ICC's for performance, self-efficacy magnitude and strength were .86, .75, and .78, respectively. Hence, 75-86% of the performance variance was accounted for by self-efficacy across participants. Self-efficacy magnitude had a significant negative relationship with race time ($r = -.26$, $p < .001$). Self-efficacy strength also had a significant negative correlation with race time ($r = -.21$, $p < .001$; see Table 1 for means, standard deviations and bivariate correlations). An increase in self-efficacy was correlated with a decrease in race time performance.

With regard to the within-person set of results, race times significantly decreased (improved) over the 7 trials ($\gamma_{10} = -1.28$, $p < .001$). Self-efficacy magnitude and strength significantly increased across trials ($\gamma_{10} = 1.22$, $p < .001$; $\gamma_{10} = 114.91$, $p < .001$). After controlling for trial and previous performance, self-efficacy magnitude ($\gamma_{30} = -.28$, $p = .02$) and self-efficacy strength ($\gamma_{30} = -.003$, $p = .007$) significantly predicted subsequent race time performance. That is, the higher the self-efficacy the lower (better) race time became (see Table 3 and Figure 2). However, when comparing the regression coefficient difference from the high feedback condition in Study 1 and the present study, no significant difference emerged ($t_{81} = .04$, $p = .94$).

Discussion

The purpose of Study 2 was to confirm and extend the findings from the high feedback condition in Study 1. Study 1 purposely used a self-efficacy measure that had been associated with negative self-efficacy effects (e.g., Vancouver et al., 2001, 2002), where reference to

previous performance was not acknowledged in the self-efficacy measure. By providing performance feedback in Study 1, a marginal significant positive relationship emerged. In Study 2, the results revealed a strong significant positive relationship between self-efficacy and performance.

The purpose of Study 3 was to further confirm and extend the results of the previous two studies by examining in a new light previous research that has revealed a negative self-efficacy – performance relationship in a golf putting paradigm (i.e., Beattie et al., 2011; 2014). We argue that participants in these studies suffered from a lack of feedback and that providing feedback to participants will reveal positive self-efficacy effects. To further extend the feedback protocols from Studies 1 and 2, we provided participants with performance information on each of their previous trials before asking them to make self-efficacy judgements. Such a protocol is more aligned to the efficacy judgements that we make in everyday life. That is, we do not make judgements on a single previous trial, but rather on a plethora of cues and information from previous performances. By giving participants such detailed information, we hypothesised that greater well-informed self-efficacy judgements would result greater performance (cf. Bandura & Locke, 2003).

Study 3

Participants

Forty-five participants (42 men and 3 women, Mage = 28.22, SD = 5.15) completed the study. A golf putting task was used where all participants had either no or minimum experience of golf (i.e., played less the 3 times per year). Informed consent was obtained before testing commenced.

Measures

Self-efficacy. Self-efficacy magnitude was recorded by asking participants to indicate (*yes*/*no*) if they believed they were able to improve upon their baseline score (e.g., "I'm confident in my ability to beat my base line score by 1 point"; "I'm confident in my ability to beat my base line score by 2 points" in intervals of one point to "I'm confident in my ability to beat my base line score by 40 points." Therefore, a score of 0-40 was recorded for each trial. Self-efficacy strength was recorded by asking participants to rate their confidence in their ability to perform at that particular level on a scale of 0-100% (where 0 = *no confidence at all* and 100 = *completely confident*). Participants only responded for each score against a magnitude level answered *yes* to give a total efficacy score between 0 and 4000. Before completing the self-efficacy measure, participants were made aware of their baseline performance score, all previous trial scores, and their current performance score.

Apparatus

Putting was performed on a 12 ft x 10 ft Huxley flat putting surface green (http://www.huxley golf.co.uk) using a standard Prosimmon KT25 putter and a standard Slazenger Raw Distance 432 dimple pattern golf balls.

Procedure

The procedure partially replicated that of Beattie et al. (2014). The experiment consisted of three practice trials and ten experimental trials each comprising 20 putts. Putts were made from 4 different starting positions each 240 cm from the hole. To reduce task monotony, each putt was made perpendicularly to the previous putt at a distance of 30 cm from that putting position. Participants had to start from a different start position at each trial. A scoring system involved four concentric circles that were 5 cm distant from one another that surrounded the

hole. Participants gained 5 points for a successful putt. If they missed the hole by up to 5 cm (i.e., the ball stopped inside the first concentric circle from the hole 0-5 cm) then they were awarded 4 points; 3 points were awarded if the ball landed within the second concentric circle but outside the first (i.e., landed within 5-10 cm from the hole) and so on. A maximum score of 100 points (20 successful putts) could be achieved on any single trial.

Participants were given 3 practice trials (of 20 putts) where a baseline measure of performance was taken. After completion of the 3 practices trials, we used each participant's best baseline performance as the performance that he/she was asked to improve upon over the remaining 10 performance trials. After each trial, participants' were informed of how many points they had achieved on that trial (and in all previous trials) before completing the self-efficacy questionnaire regarding their subsequent trial. To motivate participants cash prizes of £50, £30, and £20 were provided for the top three performance scores in any one trial.

Results

Hierarchical Liner Modelling (HLM; Bryk & Raudenbush, 2002) Version 7 was used in identical fashion to that of study 1 and 2. The ICC's for performance, self-efficacy magnitude and strength were .59, .39, and .36. Hence, 36% to 59% of the variance was accounted for across participants. Self-efficacy magnitude had a significant positive relationship with performance ($r = .26$, $p < .001$). Self-efficacy strength also had a significant positive correlation with performance ($r = .26$, $p < .001$; see Table 1 for means, standard deviations and bivariate correlations). An increase in self-efficacy was correlated with an increase in putting performance.

With regards to the within-person set of results, putting performance significantly increased over the 10 trials ($\gamma 10 = 1.41$, $p < .001$). Self-efficacy magnitude and strength also significantly increased across trials ($\gamma 10 = 1.68$, $p < .001$; $\gamma 10 = 152$, $p < .001$. After controlling

for trial and previous performance, self-efficacy magnitude ($\gamma 30 = .40$, $p < .001$) and self-efficacy strength ($\gamma 30 = .004$, $p < .001$) significantly predicted subsequent performance. That is, the higher self-efficacy led to better putting performance (see Table 4 and Figure 3).

General discussion

There has been a long-standing controversy regarding the within-person relationship between self-efficacy and performance (e.g., Bandura & Locke, 2003; Vancouver et al, 2001; 2002). The current set of studies goes some way in resolving it by showing that self-efficacy will have a positive relationship with performance, if participants have access to feedback regarding their preparatory performances. This is not something previously considered at depth in the literature. It was hypothesized that by improving knowledge of one's skill level (by making knowledge of previous performance more accessible) would reduce performance ambiguity and therefore eliminate negative self-efficacy effects that has been demonstrated in tasks that are high in ambiguity (c.f., Bandura & Locke, 2003; Vancouver., 2001, 2002).

In Study 1, the hypothesis was supported in that self-efficacy had a slight negative relationship with performance in the low feedback condition, but a marginal significant positive relationship with performance in the high feedback condition. Study 2 addressed a possible limitation where the self-efficacy measure itself may play a role in the negative effects shown in previous research. However, although a stronger significant positive relationship between self-efficacy and performance emerged, it was not significantly stronger than the relationship shown in the high feedback group in Study 1. The purpose of Study 3 was to apply the feedback principle to a task where negative effects of self-efficacy upon performance have been consistently revealed (i.e., golf putting; Beattie et al., 2011, 2014). By providing the participants

with feedback regarding baseline performance and each subsequent performance trial, self-efficacy had a positive relationship with subsequent performance.

In Study 1, a significant interaction occurred as a result of feedback condition. By providing race times for the current trial only, seemed to contribute to the non-significant negative self-efficacy effect shown in previous research (e.g., Sitzman & Yeo, 2013). However, providing an additional amount of performance feedback (i.e., baseline performance time) resulted in a significant positive relationship. As stated, limiting the amount of information on which to base self-efficacy beliefs creates task ambiguity (see also Bandura & Locke, 2003). By creating ambiguity, one cannot accurately infer efficacy judgements, which have been shown to promote negative efficacy effects (e.g., Schmidt & DeShon, 2010). It seems that the positive relationship in the high feedback condition occurred by providing participants with a minimum amount of performance feedback (baseline performance only). However, when feedback is provided in this way, it will give the participants a real sense of performance progress (as they have a reference point of where they started from). In such instances, they are better equipped to monitor progress across time and make more accurate efficacy judgements.

Study 2 examined the possibility that the self-efficacy measure may also be a limiting factor when efficacy beliefs are reported. In such instances, where self-efficacy only measures improvement from an immediate previous performance trial (as opposed to a stable baseline performance), one is measuring something different at each time point (as performance changes). That is, the point of reference changes upon each trial, which makes it impossible to ascertain precisely the mechanism that might underpin the relationship between self-efficacy and performance. Further, a self-efficacy measure that only assesses what one can do only on a subsequent trial, with little or no feedback from previous trials, seems a limiting assessment,

especially when one lacks task experience. By changing the self-efficacy measure to incorporate how well one could improve upon a baseline performance, did not significantly increase the strength of the regression coefficient, it did produce a stronger significant alpha value than Study 2. Therefore, it appears that by providing a higher amount of performance feedback before participants make a self-efficacy judgement would be the major recommendation from Study 1 and 2.

Study 3 extended this approach by re-examining the effect of performance feedback on a task where self-efficacy has been shown to consistently have a negative relationship with performance (e.g., golf putting; Beattie et al., 2011, 2014). A strong and positive self-efficacy relationship with performance occurred, reversing the trend observed by Beattie et al. (2011, 2014). By asking participants to rate their efficacy with regard to the best score they achieved in the practice trials, and provide performance feedback on every trial thereafter, participants were able to observe progress and be more aware of mastery experiences over time. This added to a real sense of efficacy beliefs building across trials which has been absent in previous research (e.g., Beattie et al., 2011; Vancouver et al., 2001, 2002). Further, by providing participants with a wealth of previous performance information before making self-efficacy judgements, also limits the risk of participants miscalibration their efficacy beliefs. For example, Vancouver et al. (2001) highlight that one of the reasons for a negative self-efficacy performance relationship is due to actual beliefs mismatching actual capacity. In such cases, negative effects arise is due to one's miscalibration of effort required. Providing performance feedback will limit this effect.

The current study's manipulation of task ambiguity differs to that of previous research (e.g., Schmidt & DeShon, 2010). Schmidt and DeShon created low ambiguity by telling participants exactly how many solutions to an anagram there were in any one trial. High

ambiguity was manipulated by not telling the participants how many solutions there were. Results revealed that high task ambiguity led to a decrease in effort and a negative effect between self-efficacy and performance. However, in the present study the task and objectives were completely unambiguous (i.e., race around the track as quickly as you can; or putt as many balls as possible). What created the task ambiguity in the current set of studies, was limiting the amount of information regarding previous performances before self-efficacy judgements were made. It seems that by providing performance feedback prevents miss-calibration and allows more accurate self-prediction.

There are some limitations to the current set of studies. In Study 1, the positive effect in the high feedback condition may have occurred through participants having prior knowledge of the racing track. That is, they had 3 extra practice laps on the track where the experimental trials were conducted compared to the low feedback group. This was done to help build mastery experience upon which participants could base their efficacy beliefs. However, it is unlikely that having practice trials on the same track was a causal reason for the effects shown. Firstly, there were no performance differences across the feedback condition. Second, Beattie et al. (2014) recently examined the moderating effects that time on task may have on the direction of the self-efficacy and performance relationship. They found that in early learning (across 10 trials) a negative efficacy effect occurred. However, a positive effect occurred when learning was extended (40 trials). Therefore it is unlikely that the sole cause of the significant positive effect in Study 1 was having 3 extra trials.

To conclude, it is likely that a miscalibration of self-efficacy beliefs will occur if vital performance information regarding one's previous levels of performance accomplishments is not

provided. As Bandura (1997) notes, “Like any other cognitive determinant, efficacy beliefs cannot operate as a regulative influence in an informational vacuum” (p. 66).

References

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191-215. doi:10.1037/0033-295X.84.2.191

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology, 88,* 87-99. doi:10.1037/0021-9010.88.1.87

Beattie, S., Fakehy, M., & Woodman, T. (2014). Examining the moderating effects of time on task and task complexity on the within person self-efficacy and performance relationship. *Psychology of Sport and Exercise.* doi: 10.1016/j.psychsport.2014.06.007

Beattie, S., Lief, D., Adamoulas, M., & Oliver, E. (2011). Investigating the possible negative effects of self-efficacy upon golf putting performance. *Psychology of Sport and Exercise, 12*, 434-441. doi: 10.1016/j.psychsport.2011.02.004

Bryk, A. S., & Raudenbush, S. W. (2002). *Hierarchical linear models: Applications and data analysis methods*. Second edition. Sage Publications, Inc.

Chase, M. A. (2001). Children's self-efficacy, motivation intentions, and attributions in physical education and sport. *Research Quarterly for Exercise and Sport, 72,* 47-54. doi: 10.1080/02701367.2001.10608931

Escarti, A., & Guzman, J. F. (1999). Effects of feedback on self-efficacy, performance, and choice on an athletic task. *Journal of Applied Sport Psychology, 11,* 83-96. doi: 10.1080/10413209908402952

Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The relationship of self-

efficacy measures to sport performance: A meta-analytical review. *Research Quarterly for Exercise and Sport, 71,* 280-294. doi:10.1080/02701367.2000.10608908

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: a meta-analytical investigation. *Journal of Counselling Psychology, 38,* 30-38. doi: 10.1037/0022-0167.38.1.30

Orbell, S., Johnston, M., Rowley, D., Davey, P., & Espley, A. (2001). Self-efficacy and goal importance in the prediction of physical disability in people following hospitalization: A prospective study. *British Journal of Health Psychology, 6,* 25-40. doi: 10.1348/135910701169034

Powers, W. T. (1973). *Behavior: The control of perception*. New York: Hawthorne.

Powers, W. T. (1991). Commentary on Bandura's "human agency." *American Psychologist, 46,* 151-153. doi: 10.1037/0003-066X.46.2.151.b

Richard, E. M., Diefendorff, J. M., & Martin, J. H. (2006). Revisiting the within-person self-efficacy and performance relation. *Human Performance, 19,* 67-87. doi:10.1207/s15327043hup1901_4

Schmidt, A. M., & DeShon, R. P. (2009). Prior performance and goal progress as moderators of the relationship between self-efficacy and performance. *Human Performance, 22,* 191-203. doi:10.1080/08959280902970377

Schmidt, A. M., & DeShon, R. P. (2010). The moderating effects of performance ambiguity on the relationship between self-efficacy and performance. *Journal of Applied Psychology, 95,* 572-581. doi:10.1037/a0018289

Seo, M., & Ilies, R. (2009). The role of self-efficacy, goal, and affect in dynamic motivational

self-regulation. *Organizational Behavior and Human Decision Processes, 109,* 120-133. doi: 10.1016/j.obhdp.2009.03.001

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R.W. (1982). The self-efficacy scale: construction and validation. *Psychological Reports,* 51, 663-671. doi: 10.2466/pr0.1982.51.2.663

Sitzmann, T., & Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: What we know and where we need to go. *Psychological Bulletin*, *137*, 421–442. doi: 10.1037/a0022777

Sitzman, T., & Yeo, G. (2013). A meta-analytical investigation of the within-person self-efficacy domain: Is self-efficacy a product of past performance or a driver of future performance? *Personnel Psychology*, *66*, 531-568. doi: 10.1111/peps.12035

Stajkovic A, D., & Lee D, S. (2001, August). *A meta-analysis of the relationship between collective efficacy and group performance*. Paper presented at the 61st Annual Meeting of the Academy of Management, Washington, DC.

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work related performance: A meta-analysis. *Psychological Bulletin, 124,* 240-261. doi: 10.1037/0033-2909.124.2.240

Vancouver, J. B., & Kendall, L. N. (2006). When self-efficacy negatively relates to motivation and performance in a learning context. *Journal of Applied Psychology, 91,* 1146-1153. doi:10.1037/0021-9010.91.5.1146

Vancouver, J. B., More, K. M., & Yoder, R. J. (2008). Self-efficacy and resource allocation: Support for a nonmonotonic, discontinuous model. *Journal of Applied Psychology*, *93,* 35-47. doi:10.1037/0021-9010.93.1.35

Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology, 87,* 506-516. doi:10.1037/0021-9010.87.3.506

Vancouver, J. B., Thompson, C. M., & Williams, A. A. (2001). The changing signs in the relationships between self-efficacy, personal goals, and performance. *Journal of Applied Psychology, 86,* 605-620. doi:10.1037/0021-9010.86.4.605

Waung, M., MacNeil, M., & Vance, R. J. (1995). Reactions to feedback in goal choice and goal change process. *Journal of Applied Social Psychology, 25,* 1360-1390. DOI: 10.1111/j.1559-1816.1995.tb02622.x

Woodman, T., Akehurst, S., Hardy, L., and Beattie, S. (2010). Self-confidence and Performance: A little self-doubt helps. *Psychology of Sport and Exercise, 11*, 467-470. DOI: 10.1016/j.psychsport.2010.05.009

Yeo, G. B., & Neal, A. (2006). An examination of the dynamic relationship between self-efficacy and performance across levels of analysis and levels of specificity. *Journal of Applied Psychology, 91,* 1088-1101. doi:10.1037/0021-9010.91.5.1088

Table 1

Means, standard deviations, interclass and bivariate correlations between self-efficacy magnitude and strength and performance across Studies 1, 2 and 3

Study 1					
Variable	*Mean*	*SD*	*ICC*	*1*	*2*
1. Performance	286.4	16.3	.82		
2. Self-efficacy magnitude	286.2	17.95	.80	.87***	
3. Self-efficacy strength	68.93	16.54	.47	-.02	-.05
Study 2					
Variable	*Mean*	*SD*	*ICC*	*1*	*2*
Performance	310.2	11.7	.86		
Self-efficacy magnitude	9.75	4.21	.75	-.26***	
Self-efficacy strength	846.6	394.7	.78	-.21***	.97***
Study 3					
Variable	*Mean*	*SD*	*ICC*	*1*	*2*
1. Performance	54.62	11.98	.82		
2. Self-efficacy magnitude	14.89	7.88	.80	.26***	
3. Self-efficacy strength	1351	759	.47	.26***	.96***

Table 2

Main and conditional interactive effects between self-efficacy and performance in Study 1

Step	γ	SE	df
Self-efficacy magnitude as dependent variable			
1. Trial	-2.23***	.17	86
2. Previous performance	.69***	.03	86
Self-efficacy strength as dependent variable			
1. Trial	-1.42***	.29	86
2. Previous performance	.08	.07	86
Subsequent performance as dependant variable			
1. Trial	-1.75***	.14	86
2. Previous performance	.03	.03	86
3. Self-efficacy magnitude	-.07	.09	86
3. Self-efficacy strength	.07***	.02	86
4a. Condition interaction Self-efficacy magnitude	-.38***	.07	86
4a. Condition interaction Self-efficacy strength	.06	.04	86

*$p < .05$; **$p < .01$; ***$p < .001$

Table 3

Main effects between self-efficacy and performance in Study 2

Step	γ	SE	df
Self-efficacy magnitude as dependent variable			
1. Trial	1.22***	.09	43
2. Previous performance	-.64***	.04	43
Self-efficacy strength as dependent variable			
1. Trial	114.9***	9.68	43
2. Previous performance	-61.9***	4.68	43
Subsequent performance as dependent variable			
1. Trial	-1.28***	.10	43
2. Previous performance	-.11	.06	43
3. Self-efficacy magnitude	-.28***	.11	43
3. Self-efficacy strength	-.003***	.001	43

*$p < .05$; **$p < .01$; ***$p < .001$

Table 4

Main effects between self-efficacy and performance in Study 3

Step	γ	SE	df
Self-efficacy magnitude as dependent variable			
1. Trial	1.68***	.13	44
2. Previous performance	.43***	.03	44
Self-efficacy strength as dependent variable			
1. Trial	152***	13.43	44
2. Previous performance	46.8***	3.96	44
Subsequent performance as dependent variable			
1. Trial	1.47***	.15	44
2. Previous performance	-.14***	.04	44
3. Self-efficacy magnitude	.40***	.11	44
3. Self-efficacy strength	.004***	.001	44

*$p < .05$; **$p < .01$; ***$p < .001$

Figure 1. The interaction between self-efficacy and feedback condition upon race time performance (lower race time represent better performance).

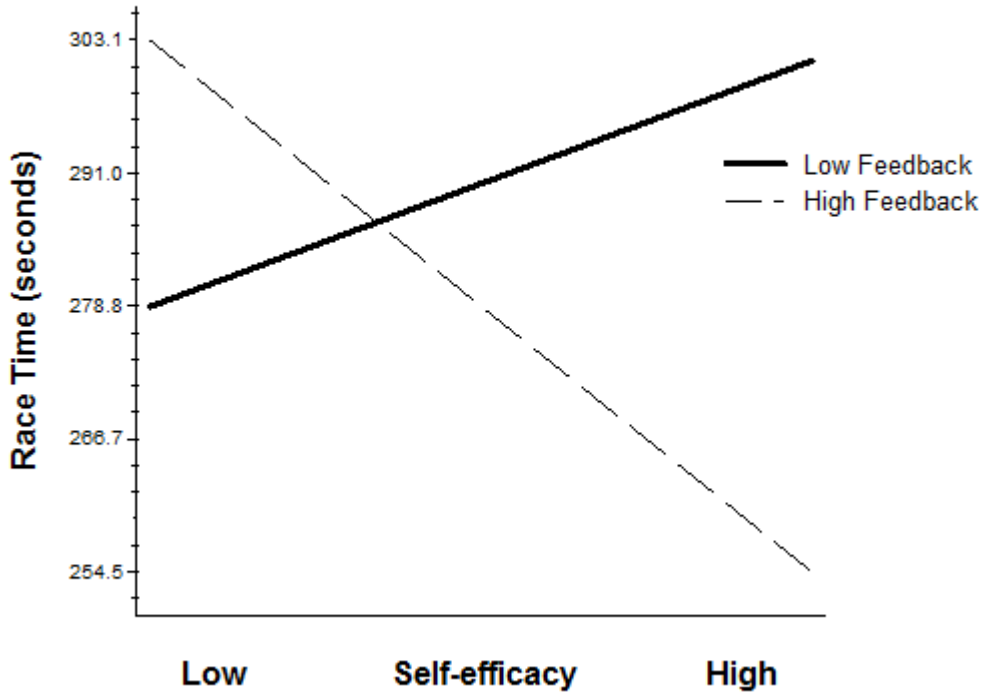

Figure 2. Individual regression slopes showing the relationship between self-efficacy and race time performance in study 2.

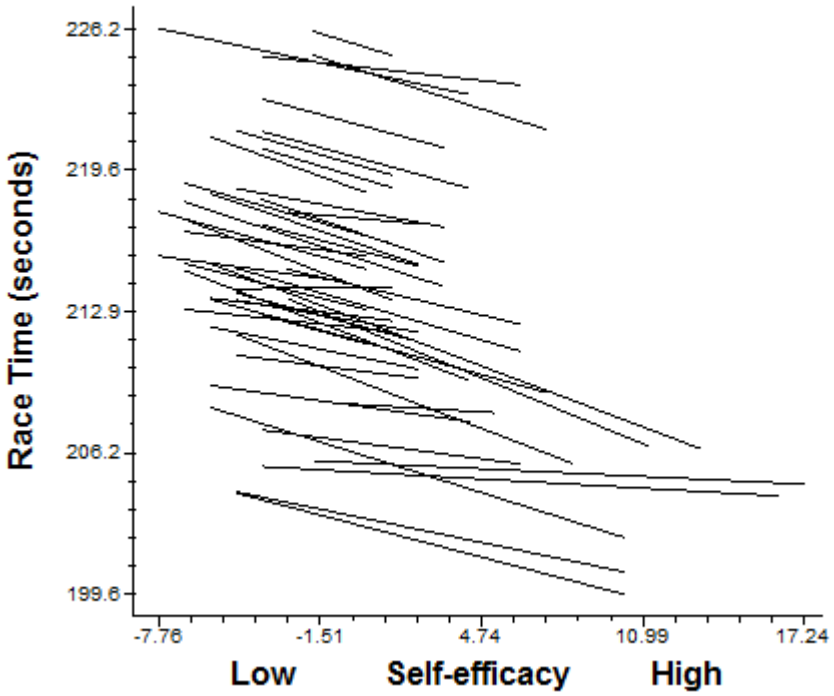

Figure 2. Individual regression slopes showing the relationship between self-efficacy and putting performance in study 3.