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Examining the moderating effects of time on task and task complexity on the within person self-efficacy and performance relationship

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ABSTRACT

Objectives: The study examined two moderating variables that may influence the direction of the effect of self-efficacy upon performance, namely; time spent on task and task complexity.
Design: Multilevel analysis was conducted to examine within person and between group relationships.
Method: Eighty eight novice golfers putted in 4 sessions over a period of 2 days (completing 800 putts in total). Each session contained 10 trials of 20 putts. The golfers were split into 2 conditions; a stable task condition where task requirements remained constant across time and a dynamic task condition, where task complexity changed across time.
Results: In early learning (i.e., the first 10 trials) results revealed a slight negative effect between self-efficacy and subsequent performance. However, across the 40 trials self-efficacy had a positive effect upon subsequent performance. Further, there was a significant task condition (stable vs. dynamic) interaction. In the easy task condition, self-efficacy showed a slight (but non-significant) positive effect upon performance. However, in the dynamic learning condition, self-efficacy had a positive and significant effect upon subsequent performance.
Conclusion: Previous tests of the within person self-efficacy relationship tend to limit learning to 10 trials or less. The study is the first to examine the reciprocal relationship between self-efficacy and performance as a result of task experience (i.e., time spent on the task) and task complexity simultaneously. Positive effects emerged as a result of extended time learning the task and by varying the degree of task complexity whilst learning.

Self-efficacy theory (Bandura, 1977, 1986, 1997) posits that successful mastery experiences help build and maintain robust efficacy beliefs. In turn, such efficacy beliefs help maintain and increase effort and performance (Bandura, 1997). Self-efficacy is defined as "beliefs in one's capabilities to organise and execute courses of action required to produce given attainments" (Bandura, 1997, p. 3). However, recent research has questioned exactly how useful self-efficacy beliefs actually are in reciprocating its positive effect upon performance (e.g., Beattie, Lief, Adamoulas, & Oliver, 2011; Vancouver & Kendall, 2006; Vancouver, More, & Yoder, 2008; Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001; Yeo & Neal, 2006). For example, Vancouver et al. (2001) stated that there has been an overreliance upon cross-sectional correlational self-efficacy studies and that the self-efficacy and performance relationship may be quite different at the within person level of analysis. In support of this, the above studies revealed a negative relationship between self-efficacy and subsequent performance at this level of analysis.

In explaining why negative self-efficacy effects may occur, Vancouver et al. (2001, 2002) based their hypothesis upon Powers (1973) perceptual control theory. According to Powers (1991) and Vancouver et al. (2001, 2002), self-efficacy could negatively bias one's perceptions of goal progress. That is, high levels of self-efficacy may be negatively related to the allocation of effort because individuals no longer feel the need to invest maximum effort (see also Vancouver, 2012). Vancouver et al. (2001, 2002) tested this hypothesis in an analytical task (mastermind) and found support for self-efficacy theory in that previous performance was a strong positive predictor of self-efficacy beliefs. However, self-efficacy had a significant negative relationship with

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subsequent performance, in that high levels of self-efficacy biased one's perception that a correct solution to the problem was found, when in fact the solution was wrong.

Critics of such research (e.g., Bandura, 2012; Bandura & Locke, 2003) argue that previous tests of the within person self-efficacy/performance relationship are limited in that such tests require "a dynamic rather than a static environment" (p. 96). In other words, when assessing such reciprocal effects, the structure of the ongoing activity should be challenging (as challenging tasks seem to serve the impetus for the mobilisation of effort; e.g., Locke & Latham, 1990). Bandura and Locke (2003) further argued that if the task is static and unchallenging, and task requirements remain constant across time, then generally nothing is learnable and performance quickly stabilizes. Further, even in tasks where learning does occur, if it is performed repeatedly over time where learning is limited within one trial and not across task trials, results again can be misinformative (cf. Bandura, 2012; Bandura & Locke, 2003). In other words, even though a learning effect may occur across time, self-efficacy's effect upon performance may be negated if the task is easy, performed in an unchallenging environment and learning is not derived from previous trials.

To address some of these limitations, Beattie et al. (2011) examined the reciprocal relationship between self-efficacy and performance in novice golfers where motor performance could improve across time. Their two study approach tested such effects in an easy putting condition and a more difficult putting condition. In both conditions participants made a total number of 200 putts across 2 practice and 8 experimental trials (20 putts per trial). Results revealed significant positive growth trajectories for learning and self-efficacy across trials (addressing previous limitations). Further, previous performance had a positive effect upon subsequent self-efficacy. However, self-efficacy had a weak non-significant negative relationship upon subsequent performance at the within person level, showing some support for Vancouver et al.'s hypotheses.

Nevertheless, a number of limitations to these studies remain. By the authors own acknowledgement, the learning paradigm that they used (i.e., 200 uphill putts) may not have provided participants with a significant amount of time (or experiences) which to base self-efficacy judgements upon. In other golf putting studies (e.g., Masters, 1992) learning has been shown to continue over the duration of 500 putts. Further, learning (or task performance) in both studies only increased by 1 putt across the 8 performance trials (7.29–8.29 and 4.64 to 5.45 respectively). Likewise, self-efficacy beliefs with regards to successful putts one could make also only increased by 1 across the 8 trials (10.43–11.76 and 9.5 to 10.27 respectively). These studies seem to have promoted the environment that Bandura and Locke (2003) argue against using. A further limitation is the way that performance and self-efficacy was assessed. Beattie et al. (2011) used a measure of successful and non-successful putts. In other words, skill learning may have been occurring at the individual level (i.e., they were putting closer to the hole) which went undetected. Therefore, due to these limitations and the importance of the within person self-efficacy debate, it would be pertinent to re-examine these findings.

One further consideration concerns how and when self-efficacy may exert positive and negative effects (or no effect) upon performance. A recent meta-analysis of 38 published and unpublished within person data sets found that approximately one third of these studies revealed negative effects, one third revealed null effects, and one third revealed positive effects between self-efficacy and performance (Sitzman & Yeo, 2013). Further, Sitzman and Yeo reported a number of moderating variables that may determine when self-efficacy had a positive, negative or no effect upon performance (see Sitzman & Yeo, 2013 for a full discussion). One moderating variable related to the present study is task difficulty. Beck and Schmidt (2012) found that in a stock market prediction task, goal difficulty moderated the relationship between self-efficacy and performance. That is, a negative relationship occurred for those assigned an easy goal and a positive relationship emerged for those assigned a difficult goal (supporting some of the criticisms proposed by Bandura & Locke, 2003). Although Beattie et al. (2011) also examined task difficulty, the fact that putting only increased by 1 across trials (in both easy and difficult conditions) showed that the uphill putting task was too difficult for learning effects to occur.

With regards to the present study, to address the first limitation that a lack of learning occurred in the Beattie et al. study, participants were required to putt over the course of 4 sessions with each session containing 200 putts. This extended the learning time from Beattie et al. from 200 putts to 800 putts. To provide a more accurate level of skill development and performance, a target zone was used to measure putting performance improvements over time rather than absolute putts obtained. The final limitation addressed the possibility that negative efficacy effects may be accounted for by stable easy tasks by splitting the learning task into two learning conditions. Half the participants performed in a static task where task environment remained constant across time. The other half of the participants performed the same putting task but the task environment changed across time. That is, the putting task remained constant across conditions, but a degree of task difficulty was manipulated that changed across sessions.

Hypotheses generally followed that of previous research (e.g., Beattie et al., 2011; Vancouver et al., 2001). First, by addressing previous limitations, performance and self-efficacy should show significant changes across time. Second, previous performance should be a strong predictor of subsequent self-efficacy. Third, if negative self-efficacy effects are mainly due to lack of task experience, then self-efficacy will be negatively related to performance in early learning trials but positively related to performance when learning trials are extended. Finally, as task difficulty has been shown to moderate the relationship between self-efficacy and performance (e.g., Beck & Schmidt, 2012), then self-efficacy will have a weak negative or non-significant relationship with performance in the stable easy task condition but a positive relationship with performance when the task is more dynamic and challenging in nature.

Method

Participants

Eighty-eight participants (61 men and 27 women, $M_{age} = 24.45$, $SD = 3.79$) volunteered to take part in the study. All participants had either no or minimum experience in golf putting. Informed consent was obtained from all participants before taking part in the study.

Apparatus

Golf putts were performed on a 12 ft × 10 ft Huxley flat surface putting green (http://www.huxleygolf.co.uk) using a standard Prosimmon KT25 putter and a set of 20 Slazenger Raw Distance 432 dimple pattern golf balls.

Procedure

Participants completed 4 putting sessions over a period of 2 days. Sessions 1 and 2 were completed on day 1 and sessions 3 and 4 were completed the following day. A 15 min break was provided in between sessions 1 and 2 and sessions 3 and 4. Participants were