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The role of working memory in achievement goal pursuit☆

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ABSTRACT

The present research examined the role of working memory in the pursuit of qualitatively different achievement goals. Pursuit of a mastery-approach goal entails a focus on developing self-referential competence while a performance-approach goal entails a focus on demonstrating normative competence. Across two experiments it was found that, when working memory is loaded, individuals pursuing a mastery-approach goal experienced larger performance decrements than individuals pursuing a performance-approach goal or those in a no-goal control. It was also found that reliance upon working memory intensive strategies (explicit strategies) was more evident for those in a mastery-approach condition, whereas reliance upon less working memory intensive strategies (implicit strategies) was more evident for those in the performance-approach condition. Results suggest that a motivated focus on developing self-referential skill relies heavily on working memory, facilitated by the use of deliberative, 'step-by-step' strategies during goal pursuit. Conversely, a focus on demonstrating normative skill depends less on working memory, facilitated by the use of more heuristic 'short-cut' strategies during goal pursuit. These findings show, for the first time, that working memory plays an important, but selective, role in achievement goal pursuit.

1. Introduction

Achievement goals concern the purpose of motivated behaviour in achievement settings, and are conceptualised in terms of a motivated focus on qualitatively different competence related outcomes (Dweck, 1986; Elliot, 1999, 2005; Nicholls, 1984). For instance, one might be motivated to develop self-referential competence (i.e., a *mastery-approach goal*), or to demonstrate normative competence (i.e., a *performance-approach goal*). An extensive literature shows that these goals differentially impact upon achievement outcomes in a range of settings (see Senko, Durik, & Harackiewicz, 2008; Senko, Hulleman, & Harackiewicz, 2011). Less is known, however, about *how* achievement goals might go about exerting an effect on such outcomes. In this paper, we investigate the way in which achievement goals might differentially engage working memory resources. Working memory (Baddeley, 2000; Baddeley & Hitch, 1974; Engle, 2002) plays a critical role in the goal-directed control of attention, by guiding, preserving and updating attention to goal-directed processes and information (Conway, Cowan, & Bunting, 2001; Hofmann, Schmeichel, Friese, & Baddeley, 2011; Lavie & de Fockert, 2005; Miller & Cohen, 2001). It therefore seems likely that working memory is critically involved in achievement goal pursuit. The aim of this paper is to understand how mastery-approach and performance-approach goals engage working memory resources, thereby shedding light on the cognitive processes that may underlie the effects that these goals have on achievement outcomes.

The distinction between mastery-approach goals (i.e., focus on developing skill) and performance-approach goals (i.e., focus on demonstrating skill) is a fundamental dichotomy in the achievement goal literature (Dweck, 1986). These achievement goal states can be elicited by simple cues or instructions, such as framing the purpose of a task as an opportunity to outperform others (performance-approach) or to learn something new (mastery-approach) (e.g., Elliot, Shell, Henry, & Maier, 2005) (see Elliot, 2005). Although beyond the scope of the present research, it is important to note that one can also be motivated to avoid demonstration of normative incompetence (*performance-avoid focus*) or to avoid deterioration of self-referential competence (*mastery-avoid focus*) (Elliot, 1999; Elliot & Church, 1997; Elliot & McGregor, 2001). The present research is designed to focus specifically on the role of working memory in mastery-approach and performance-approach goal pursuit.

Pursuit of these different approach-oriented achievement goals has been shown to produce differential outcomes, particularly in academic settings. For instance, performance-approach goals tend to predict actual academic performance, while mastery-approach goals tend to predict academic interest (Hulleman, Durik, Schweigert, & Harackiewicz, 2008). Relatively less research has examined the cognitive processes through

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which these effects might operate. Mastery-approach goal states have been linked with deep processing tendencies and elaborative learning strategies, while performance-approach goal states have been associated with more surface-level task engagement and rote learning (Harackiewicz & Linnenbrink, 2005). Performance-approach goal pursuit has been found to strategically direct attention towards material essential for task performance (Elliot et al., 2005), and to foster cheating behaviour (Van Yperen, Hamstra, & Van der Klauw, 2011), compared to mastery-approach goal pursuit. In relation to memory performance, research has shown superior maintenance of memory strategies in recall tasks for mastery-approach, relative to performance-approach (Escribe & Huet, 2005). Researchers have also found enhanced recall for deeply processed information for mastery-approach, relative to performance-approach (Graham & Golan, 1991), however others have failed to replicate such findings (Barker, McInerney, & Dowson, 2002).

Despite these promising indications of the cognitive processes that might characterise achievement goal pursuit, few studies have considered the role of working memory. This is surprising as research informs us that working memory plays a major, though varied, role in a wide range of goal-directed behaviours (DeShon, Brown, & Greenis, 1996; Krawczyk & D'Esposito, 2011; Treisman & Doctor, 1987; Wegge, 2001; Worthy, Markman, & Maddox, 2009). In terms of achievement goals, Linnenbrink, Ryan, and Pintrich (1999) reported a positive association between working memory capacity scores (as measured by Reading Span, RSPAN; Daneman & Carpenter, 1980) and self-reported mastery-approach goals. More recently, Avery and Smillie (2013) examined the influence of experimentally manipulated mastery-approach and performance-approach goals on working memory under varying executive load, using a numerical N-Back task (Gevins & Cutillo, 1993). It was found that pursuit of a performance-approach goal resulted in poorer working memory processing than pursuit of a mastery-approach goal or no-goal control. Moreover, this achievement goal effect was restricted to the greatest executive load of the task relative to less demanding loads. This is consistent with research showing that achievement goals impact most upon performance in cognitively demanding conditions (Barker et al., 2002; Graham & Golan, 1991). Also relevant is a recent study by Crouzevialle and Butera (2012), who found that pursuit of performance-approach goals generated distractive concerns that depleted working memory resources relative to a no-instruction control group. These authors argue that allocation of such resources is divided among the storage, processing, and retrieval of task-relevant information, and, the activation of performance-approach goal concerns.

Thus, although some research has examined how working memory performance varies under different goal pursuit conditions, the role that working memory plays in the pursuit of mastery-approach and performance-approach goals remains unclear. That is, the extent to which mastery-approach and performance-approach goal pursuit might differentially engage working memory resources given task strategies employed, is yet to be investigated. Such investigation would be highly complementary to previous work described by offering some explanation for varying cognitive performance for these goal states (Bereby-Meyer & Kaplan, 2005; Escribe & Huet, 2005), especially when a task is executively demanding (Avery & Smillie, 2013; Graham & Golan, 1991). Furthermore, investigation of the role that working memory plays could offer some explanatory grounds for information processing patterns (Graham & Golan, 1991; Harackiewicz & Linnenbrink, 2005) observed for these goal states (i.e., can task strategy working memory resource requirements account for why deeper processing of material is more favourable with mastery-approach goal pursuit?). In exploring the working memory requirements of task strategies employed by these goal states, the current work offers much scope for developing theoretical understanding of how mastery-approach and performance-approach goal states actually go about exerting an effect on cognitive and ultimately academic performance.

One way to address this question is to ask whether the availability of working memory resources has consequences for task performance depending on which achievement goal is being pursued. The current paper aims to address this novel and necessary question using dual task methodology, whereby a working memory load task is interleaved with a primary goal pursuit task. Dual task methodology involves performing two tasks simultaneously, or two interleaved tasks, with a distinction between a primary and a secondary task of interest. Performance decrements in the primary task can be attributed to the executive load of the secondary task. In the current work, two experiments are presented in which participants pursue either a mastery-approach or performance-approach goal under varying working memory load. Secondary working memory load will compete with the primary goal pursuit task for working memory resources to the extent that these are required for successful performance (Baddeley, 1986). Consequently, working memory load will affect task performance most strongly for the goal state in which working memory plays a greater role. In Experiment 1, given the discussed literature, the extent to which limited availability of working memory resources has more damaging consequences for primary task performance when pursuing a mastery-approach goal relative to a performance-approach goal is tested. In Experiment 2, task strategies employed by these goal states (under both low and high demanding task conditions) in accounting for differential working memory resources requirements is tested – specifically, whether the damaging consequences for primary task performance when pursuing a mastery-approach goal relative to a performance-approach goal is due to reliance upon more working memory intensive strategies.

2. Experiment 1

Games and puzzles offer a simple but effective way to examine goal-directed behaviour in the laboratory. Such tasks have been successfully employed to study, for instance, the role of working memory in chess performance (Robbins et al., 1995) and the impact of approach states on word-search puzzles and word matching games (Elliot & Harackiewicz, 1996; Senko & Harackiewicz, 2005; Steele-Johnson, Heintz, & Miller, 2008). For this study we constructed a word game based loosely on the *Parker Brothers* game Boggle™ as a primary achievement goal pursuit task. On each trial participants were presented with a 4 × 4 letter matrix and required to make as many words as possible. Working memory has been suggested to play a role in word formation games, allowing the retrieval of verbal information from long-term memory (Halpern & Wai, 2007).

The current word game was interleaved with a secondary task (low versus high load). If the primary achievement goal requires working memory resources, then game performance should decline at higher working memory load. Given that previous work has found a relationship between mastery-approach goals and increased working memory performance (Linnenbrink et al., 1999), and has also linked mastery-approach goals with cognitive styles that are suggestive of high working memory engagement (e.g., deep-processing learning strategies; Harackiewicz & Linnenbrink, 2005), we expected that working memory might play a greater role in the pursuit of mastery-approach goals, relative to the pursuit of performance-approach goals (i.e., a mastery-approach foci engages working memory resources more heavily during goal pursuit relative to a performance-approach foci). We therefore hypothesised that primary task performance would be most substantially disrupted by high secondary load when pursuing a mastery approach goal.

2.1. Method

2.1.1. Participants

Seventy-two[1] University of London undergraduates (47 females) from various disciplines took part and all were paid £5 for their participation. Age was recorded in five ranges (18–25; 26–35; 36–45; 46–55;

[1] One participant was removed from analyses due to exceptionally high word game performance, but this had no substantive effect on results.