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Unfulfilled goals interfere with tasks that require executive functions☆,☆☆

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ABSTRACT

Even after one stops actively pursuing a goal, many mental processes remain focused on the goal (e.g., the Zeigarnik effect), potentially occupying limited attentional and working memory resources. Five studies examined whether the processes associated with unfulfilled goals would interfere with tasks that require the executive function, which has a limited focal capacity and can pursue only one goal at a time. In Studies 1 and 2, activating a goal nonconsciously and then manipulating unfulfillment caused impairments on later tasks requiring fluid intelligence (solving anagrams; Study 1) and impulse control (dieting; Study 2). Study 3 showed that impairments were specific to executive functioning tasks: an unfulfilled goal impaired performance on logic problems but not on a test of general knowledge (only the former requires executive functions). Study 4 found that the effect was moderated by individual differences; participants who reported a tendency to shift readily amongst their various pursuits showed no task interference. Study 5 found that returning to fulfill a previously frustrated goal eliminated the interference effect. These findings provide converging evidence that unfulfilled goals can interfere with later tasks, insofar as they require executive functions.

The behavior of many animals is guided by a few simple goals, the pursuit of which can be managed effectively by rather hard-wired propensities. In contrast, human social life has allowed for the pursuit of a large variety of goals, such that people report pursuing 15 personal goals and strivings on average at any given time (Little, 1989). Some of these goals come and go, while others endure for years. Hence the human psyche requires complex and flexible systems for managing multiple pursuits.

The present research focuses on the idea that while a person may be committed to many goals at once, the conscious executive can strive to satisfy them only one at a time (James, 1890). Hence one's multiple goals effectively compete for access to the executive function, which has limited attentional capacity and working memory resources. Each unfulfilled goal remains active (Lewin, 1935), intruding into one's thoughts and attention (Zeigarnik, 1927), seeking to recapture the executive so as to move toward fulfillment. Because of this competition, the persistent intrusions into attention from unfulfilled goals can impair pursuit of the other, even ostensibly unrelated tasks. Thus, the current work extends previous research on the persistent activation of unfulfilled goals (Lewin, 1935; Klinger, 1975). The central hypothesis of the present investigation was that a prior unfulfilled goal can hamper performance on a subsequent, unrelated task insofar as this second task depends on the limited resources of the executive function.

Cognitive consequences of unfulfilled goals

When a person commences working toward a goal, multiple mental systems are aid in the process. Attention seeks out goal relevant information (Moskowitz, 2002), attitudes favor objects that facilitate success (Ferguson & Bargh, 2004), and perception brings in skewed interpretations that minimize failure (Balcetis & Dunning, 2006; Haselton & Buss, 2000; Maner et al., 2005). Meanwhile, thoughts about irrelevant goals and motivations are shuffled off to the side (Shah, Friedman, & Kruglanski, 2002).

When interruption or failure prevents goal attainment, however, then what happens? The goal can be abandoned, but this is a costly and complex process (Klinger, 1975) and, for particularly important goals, disengagement may require major alterations to the self-concept (see Wrosch, Scheier, Carver, & Schulz, 2003). Until the point of goal disengagement, therefore, the person remains committed to an incomplete endeavor.

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Many processes presumably sustain interest in a goal when it is left unfinished. Automatic processes continue to seek and process goal relevant information (Goschke & Kuhl, 1993; Förster, Liberman, & Higgins, 2005; Klinger, 1975; Rothermund, 2003; Zeigarnik, 1927) and to watch for opportunities to resume pursuit of the goal (Moskowitz, 2002). People also ruminate about goals they have not fulfilled so as to reevaluate how best to pursue them (Martin & Tesser, 1989, 2006). Thus, multiple processes push a person toward focusing on an unfulfilled goal even while the person may attempt to move on to other tasks (e.g., Smallwood & Schooler, 2006).

Could this continued focus on an unfulfilled goal occupy enough attentional resources to interfere with other pursuits? There has long been an assumption that it could, but evidence for such interference is remarkably sparse. Prior work has established that there are performance costs when switching from one task to another (Altmann & Trafton, 2007; Rogers & Monsell, 1995). However, these costs are attributable to a period of reorientation that occurs irrespective of the state of one's goals (for a review, see Monsell, 2003). Another interference effect can occur when two goals are pursued simultaneously (Cohen, Jaudas, & Gollwitzer, 2008; Cook, Marsh, Clark-Foos, & Meeks, 2007; Einstein et al., 2005; Hicks, Marsh, & Cook, 2005). Neither of these effects, however, speaks to the interference that may come from a previously unfulfilled intention. Thus far, our search of the literature has been unable to reveal empirical evidence that activation from prior, unfulfilled goals can reduce behavioral success in other pursuits.

There are reasons to think unfulfilled goals would not interfere. It would be adaptive for people to be able to set aside one goal and pursue another without difficulty. The fact that the unfulfilled goal remains active in memory would not necessarily interfere with other goals, apart from its occupation of a small amount of mental resources. The unconscious has a vast capacity for processing information (Dijksterhuis, Aarts, & Smith, 2005) and can manage and maintain goal pursuit well (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Custers & Aarts, 2007), so one should be able to function effectively on a new task despite the fact that the prior, unfulfilled task remains active in some odd corners of the mind. Indeed, research by Marsh, Hicks, and Cook (2006) has shown that an active goal will interfere only in the most demanding situations, such as when one remains vigilant for opportunities to fulfill the goal while engaged in some other task. When vigilance is not needed during an ongoing task, interference effects are absent. According to those findings, an ongoing task does not incur any meaningful cost from an active goal, except when a person must pursue both the task and goal simultaneously.

Notwithstanding the lack of evidence, there is reason to suspect that prior, unfulfilled goals could interfere with other pursuits. Indeed, research on populations with clinical depression has shown that an unfulfilled intention can be quite detrimental to other tasks, including short-term memory tests and the ability to initiate novel intentions (Kuhl & Helle, 1986). One important caveat about research on non-clinical populations is that it has focused almost exclusively on performance as defined by response times in categorization tasks, which have produced accuracy rates that invariably fall well above 90% (Marsh et al., 2006; Rogers & Monsell, 1995). Arguably, categorization takes extremely little time and effort (Grill-Spector & Kanwisher, 2005), and slight changes in response latencies may not translate into impairment on meaningful, everyday behaviors. If prior, unfulfilled goals pose a problem, it would perhaps be at some bottleneck where resources are limited. The limited capacity of the executive functions (Baddeley, 1986; Miller, 1956) may constitute just such a bottleneck.

Executive functions and goal shielding

The executive functions are a suite of complementary processes that enable control over thoughts and actions (Baddeley, 1986; Norman & Shallice, 1986). These include focusing attention, inhibiting prepotent responses, maintaining information in working memory, manipulating the contents of working memory, and switching from one task to another (Baddeley, 1986; Miyake et al., 2000; Shallice, 1982; Shimamura, 2000). In the current work, we focus on two capacities, each of which relies on multiple executive processes: impulse control and fluid intelligence. Impulse control often involves the selective avoidance of some stimuli while also inhibiting prepotent responses towards them, and tests of fluid intelligence require the active maintenance and manipulation of information in working memory. Together, impulse control and fluid intelligence require most of the executive processes outlined in previous work. Both are also fragile. If executive resources are either temporarily or chronically low, then impulse control (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Lavie, Hirst, de Fockert, & Viding, 2004; Ward & Mann, 2000) and fluid intelligence (DeWall, Baumeister, & Masicampo, 2008; Kane et al., 2004; Schmeichel, Vohs, & Baumeister, 2003) will suffer.

In the present work, we anticipated that tasks requiring executive functions—including impulse control and fluid intelligence—could suffer if a prior goal has been left unfulfilled. Research on goal shielding has indicated that when people work on a task, they automatically inhibit thoughts of information relevant to other tasks and goals (Mayr & Keele, 2000; Shah et al., 2002). The very existence of goal shielding suggests that its purpose is to limit access to some bottleneck that is incapable of feeding resources into multiple tasks at once. Our understanding is that goal shielding is necessary because of the limited focal capacity of the executive function. Executive resources such as working memory and attention can focus only on one thing at a time (James, 1890; Lieberman, Gaunt, Gilbert, & Trope, 2002). Therefore, in order for the executive function to perform one task effectively, it needs to be protected from thoughts of other pursuits.

Despite the goal shielding process that helps to shut out intrusions, executive processes are vulnerable to distraction. Visual reminders of alternative goals can interfere with an ongoing pursuit, even when those reminders are presented at subliminal levels (Shah & Kruglanski, 2002). If subtle cues from the environment can compromise goal shielding and interfere with current tasks, then reminders from internal sources may have a similar effect. Unfulfilled goals remain active in memory, occasionally intruding into one's thoughts and attention (Zeigarnik, 1927). As a result, they may occupy attention and working memory resources and so reduce the availability of executive functions for other pursuits.

Present research

The present research was based on the idea that unfulfilled goals remain highly active in memory, occupying limited attentional resources of the executive function. Even if the person has attempted to stop working toward the unfulfilled goal, incursions by the goal could interfere with the further operations of executive function. As a result, performance on other tasks could be impaired. These impairments should be specific to the executive function and should be largest among people who have difficulty letting go of one task so as to move on to another.

These predictions were tested in a series of experiments. The first two studies used nonconscious priming to activate goals and then created a sense of nonfulfillment, either by having people recall instances of failing to live up to their goal (Study 1) or by manipulating task failure (Study 2). The effects on subsequent goal pursuit were assessed by a test of fluid intelligence (anagrams, Study 1) and by impulse control in the realm of eating (Study 2). Study 3 tested the hypothesis that the impairment would be specific to the executive function: It employed two kinds of intelligence tests, one based on logical reasoning and the other on general knowledge. (Only