Investigating how implementation intentions improve non-focal prospective memory tasks

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ABSTRACT

Implementation intentions are a self-regulatory strategy broadly studied in the area of social cognition that can improve realization of one's goals and improve performance on prospective memory tasks. Three experiments, using a non-focal task for which the prospective memory targets were specified at the time of intention formation, investigated whether (and how) implementation intentions can improve non-focal prospective memory performance. An improvement in prospective memory performance was accompanied by an increase in the allocation of conscious resources to the prospective memory task, but not by an increase in perceived importance of the prospective memory task. The third experiment also investigated the effects of implementation intentions on recall of the appropriate action and found that accurate action recall was improved by implementation intentions. Finally, the effect of implementation intention instructions on cognitive processes that underlie non-focal prospective memory performance was investigated using a multinomial model.

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1. Introduction

In our daily lives we often must remember to perform an action that cannot be carried out immediately, but that must be performed in the future. This type of memory task, called Prospective Memory (PM), is fundamentally important to our daily lives. For instance, failing to remember to perform a task after being asked to do so by a spouse or boss can, at the very least, lead to irritation and could lead to even more unpleasant outcomes. Thus, improving the ability to remember to perform these tasks could have important benefits in many situations and prior research has shown that PM can be improved through the application of a self-regulatory strategy known as *implementation intentions* (Brewer & Marsh, 2010; Brom et al., 2014; Chasteen, Park, & Schwarz, 2001; Liu & Park, 2004; McDaniel, Howard, & Butler, 2008; McDaniel & Scullin, 2010; McFarland & Glisky, 2011, 2012; Meeks & Marsh, 2010; Schnitzspahn & Kliegel, 2009).

Implementation intentions, compared to standard PM instructions in full attention conditions, have been consistently shown to improve the PM of young adults in the laboratory when using *focal* PM tasks; where the ongoing task requires processing of the relevant characteristics of targets (McDaniel & Scullin, 2010; McDaniel et al., 2008; McFarland & Glisky,

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2012; Schnitzspahn & Kliegel, 2009; see Table 1).[1] In contrast, as shown in Table 2, under non-focal PM conditions, where targets are not highly integrated with ongoing task processing, findings have been more variable, with some studies showing a benefit of implementation intentions (Brewer & Marsh, 2010; Meeks & Marsh, 2010), and others not (Chasteen et al., 2001; Zimmermann & Meier, 2010). Many PM tasks in our everyday life and in work settings would be considered non-focal to ongoing task activities; therefore it is important to further examine the extent to which implementation intentions can facilitate non-focal PM.

Furthermore, when there has been improvement in non-focal PM with the use of implementation intentions, it has come at increased allocation of conscious resources to the PM task, at the expense of the ongoing task, when compared to standard PM encoding conditions (Meeks & Marsh, 2010). This increased allocation of conscious resources to the PM task might limit the applicability of implementation intention techniques to non-focal PM situations where errors or slowed performance on ongoing tasks could have dire consequences, such as the ongoing task demands performed by an air traffic controller (Loft & Remington, 2010; Loft, Smith, & Bhaskara, 2011; Loft, Smith, & Remington, 2013) or by medical professionals (Grundgeiger, Sanderson, McDougall, & Venkatesh, 2010). Techniques that can improve non-focal PM without increasing the extent to which PM tasks draw on our limited span of consciousness, and therefore not having a negative effect on ongoing task performance, would be of particular interest in many situations where the ongoing task is demanding and important. Before applying implementation intentions to such applied situations in which ongoing task performance cannot be sacrificed, it is important to understand the way in which implementation intentions lead to improved non-focal PM in the laboratory and in particular to understand how implementation intentions affect the engagement of conscious processing.

We used several approaches to investigate the effects of implementation intentions on non-focal PM. First, ongoing task performance served as an indicator of whether non-focal PM can be improved without increasing the conscious resource demands associated with the PM task. The second approach involved the application of a multinomial model to measure how implementation intentions affected the underlying cognitive processes involved in successful PM performance. The third approach involved measuring how implementation intentions affected participants' perceptions regarding the relative importance of the PM and ongoing tasks.

1.1. Implementation intentions and event-based prospective memory

Implementation intentions are special intentions that take the following form: "If Situation X is encountered, then I will perform Behavior Y!" (Brandstätter, Lengfelder, & Gollwitzer, 2001, p.946). Brandstätter et al. argue that by forming an implementation intention a link is created between the action and target event that commits the individual to performing the action when the event occurs. This is in contrast to a goal intention in which the individual is committed to a goal outcome, but not to a specific action in a particular context. Implementation intentions have been shown to improve the likelihood of carrying out everyday goal related actions such as self-examination of breasts (Orbell, Hodgkins, & Sheeran, 1997), attendance at cancer screening appointments (Orbell & Sheeran, 2000) or taking vitamins (Sheeran & Orbell, 1999). Brandstätter et al. argued that forming implementation intentions "helps goal pursuit by automatizing the initiation of a distinct goal-directed response in the presence of a certain critical situation" (p. 958), which in turn increases the likelihood that the behavior will occur. In the PM literature, forming implementation intentions is argued to increase the salience of PM targets or to strengthen the relationship between the PM targets and intended actions, allowing PM actions to be spontaneously retrieved when targets are processed as part of ongoing tasks, with relatively little need for the allocation of conscious resources to the PM task (Gollwitzer, 1999; McDaniel & Scullin, 2010; Rummel, Einstein, & Rampey, 2012).

PM tasks involve several components that may be influenced by implementation intentions: the retrospective recall of *what* is to be done (e.g., buy milk), the recognition of the event that signals *when* the action should be performed (e.g., when I see the grocery store) and remembering *that* you are supposed to do something (e.g., I need to interrupt my usual drive home to do something else). The "what" and the "when" make up the retrospective components of PM, while remembering "that" an action needs to be performed is the prospective component of PM. In the current study we use multinomial modeling to investigate how implementation intentions differentially impact these components of the PM task.

1.2. Implementation intentions and non-focal PM tasks

As discussed in Section 1, the effects of implementation intentions on non-focal PM have been mixed. Chasteen et al. (2001) found the implementation intention provided no benefit to participants required to make a PM response when a background border pattern changed during an ongoing computerized work recall task. However, because the background pattern was completely irrelevant to the ongoing recall task, it may not have been processed to the minimum level required to allow implementation intentions to facilitate target recognition. If implementation intentions improve PM by strengthening the association between the target and the action, thereby increasing the likelihood that processing of the target event will lead to retrieval of the intention, the target event must be processed for implementation intentions to improve PM.

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[1] Effects of implementation intention instructions when combined with divided attention tasks are mixed, as can be seen in Table 1. This mixed pattern of findings is discussed in Section 5.5. Meeks and Marsh (2010) used a focal task in their third experiment, but PM performance was at ceiling.