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Review article

The effect of implementation intention on prospective memory: A systematic and meta-analytic review

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ABSTRACT

Prospective memory (PM) refers to remembering to perform a planned action at a future time. Implementation intention is an encoding method in the form of "if situation Y is encountered, then I will initiate the goal-directed behavior X". It has been applied to improve PM performances. The present study conducted a systematic and meta-analytic review on the effect and mechanism of implementation intention on PM. In the meta-analysis, 36 comparisons were included. The results showed that for healthy young adults, the overall effect of implementation intention in improving PM performances was significant with a medium effect size (d=0.445). The combined verbal and imagery form of implementation intention had a relatively larger effect size (d=0.590). For older adults, implementation intention had a medium to large effect size on their PM performances (d=0.680). As for the mechanism, implementation intention seemed to reduce ongoing task performances in young adults as reflected by longer reaction time (d=0.224) though the effect size was small. The present study supports the positive effect of implementation intention on PM. The mechanism and potential implications of this promising strategy especially for clinical/sub-clinical people are discussed.

Contents

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1. Introduction

1.1. Prospective memory

Prospective memory (PM) refers to remembering to carry out intended actions at a future time (Einstein and McDaniel, 1990). There are five main phases of PM: (a) intention formation; (b) intention maintenance; (c) cue recognition and intention retrieval; (d) intention execution; and (e) evaluation of outcome (Ellis, 1996). In a typical PM experiment, participants are instructed to engage in two tasks: the ongoing and PM tasks. They are required to execute intended PM actions when PM cues appear while undertaking the ongoing task. According to the nature of the PM cue, there are two types of PM: time-based (executing the intentions at a particular time), and event-based (executing the intentions when an event cue appears) (Einstein and McDaniel, 1990, 1996; Einstein et al., 1995; Okuda et al., 2007). In recent years, PM has received increasing attention by researchers due to its importance in daily life, for example, remembering to attend a meeting on time, to turn off the stove after cooking, or take medicine. PM failures may cause unwanted and undesirable consequences. Unfortunately, many studies have found that people often show PM forgetting (Crovitz and Daniel, 1984; Terry, 1988) and individuals such as older people and patients with mental disorders suffer even more serious PM problems (Henry et al., 2004; Wang et al., 2009).

1.2. Implementation intention

Implementation intention is an encoding method to promote behaviors in the form of "if situation Y is encountered, then I will initiate the goal-directed behavior X" (Gollwitzer, 1999; Gollwitzer and Sheeran, 2006). Gollwitzer (1993, 1996, 1999) put forward implementation intention to help people to achieve intentions and goals. This method includes two components: (a) anticipation of a suitable occasion to initiate the response (the "if" part) and (b) identification of a response that promotes goal attainment (the "then" part). It specifies the exact situation and plans the particular actions for achieving the goal. To achieve a goal, people have to form a goal intention like "I intend to achieve the outcome Z" (Gollwitzer and Sheeran, 2006). Implementation intention creates a strong mental representation of the situation and a strong linkage between situation and response that makes it easy to execute the behaviors. It helps people to overcome the gaps between the intentions and the actual behaviors. A meta-analysis of the impact of implementation intention on goal achievement showed that the effect size was medium to large ($d=0.65$) (Gollwitzer and Sheeran, 2006). PM actually shares some similar characteristics with goal achievement and can be considered a type of goal achievement related task. For example, to accomplish a PM task, people need to form and execute intentions. In addition, it is necessary to make a plan. Because of this, researchers have begun to use implementation intention as a technique to improve PM performances. However, only two studies that specifically examined PM were included in Gollwitzer and Sheeran's (2006) meta-analysis study. To date, quite a number of studies have found that implementation intention was effective in improving PM performances (Breneiser, 2009; McDaniel et al., 2008; McDaniel and Scullin, 2010; McFarland and Glisky, 2012; Meeks and Marsh, 2010; Zimmermann and Meier, 2010).

The implementation intention strategy was originally suggested by Gollwitzer (1999) as a verbal statement in the format of "if… then…". However, with the development of different variations of this method by researchers, there are currently three main kinds of implementation intention encoding techniques: the verbal form (repeating the instructions) (e.g., Zimmermann and Meier, 2010), the imagery form (imagining the relevant scenes for 30–45 s) (e.g., Brewer et al., 2011b), and a combination of the two forms (e.g., Chasteen et al., 2001; McDaniel et al., 2008). Empirical data suggest that all three forms of implementation intention were effective in improving PM performances (Brewer et al., 2011a; McDaniel et al., 2008; Zimmermann and Meier, 2010). Although not many, some studies have compared the effectiveness of the three forms of implementation intention encoding on PM performances. Again, all three forms of implementation intention were found to be effective in improving PM performances. Nevertheless, in their study, McFarland and Glisky (2011) did not find much difference in effect among the three forms of implementation intention. Thus, they argued that sole adoption of the verbal form of implementation intention is sufficient to improve PM performances, and that the imagery instruction was not necessary. However, several studies have shown that under the combined implementation intention condition, participants were found to perform the best in completing PM tasks, albeit to the difference between the combined and other kinds of implementation intention did not reach statistical significance (Breneiser, 2009; McFarland and Glisky, 2011; Meeks and Marsh, 2010). In the present study, we aimed to conduct a systematic and meta-analytic review to examine and quantify the effect of implementation intention on PM performances and to compare the effects of the different types of implementation intention encoding techniques.

In the literature, the impact of implementation intention on PM performances has also been examined in different samples, such as young adults, older individuals and a wide range of clinical and sub-clinical groups. Until now, most of the studies about the effect of implementation intention on PM were conducted in young adults (e.g., Brewer et al., 2011b; McDaniel et al., 2008; McDaniel and Scullin, 2010; Meeks and Marsh, 2010). For older people, implementation intention has been found to significantly improve PM performances in both laboratory (Chasteen et al., 2001; McFarland and Glisky, 2011) and real life conditions (Burkard et al., 2014a; Liu and Park, 2004). Nevertheless, negative findings have also been reported (Schnitzspahn and Kliegel, 2009). There were also a few studies in clinical and sub-clinical groups (Chen et al., 2014; Grilli and McFarland, 2011; Kardiasmenos et al., 2008; Kretschmer et al., 2014). Thus in the current study, we also aimed to conduct a systematic and meta-analytic review to evaluate and summarize the effect of implementation intention in different populations, including healthy young adults and older adults. Due to the limited number of studies and the mixed types of clinical and sub-clinical samples, we aimed to briefly describe the effect of implementation intention on PM in these samples.

1.3. The mechanism of implementation intention

The underlying mechanisms of implementation intention in promoting PM remain unclear and controversial. There are mainly

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