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The role of visual perceptual style and personality disorder traits in event-based prospective memory

Giovanna Nigro [a,*], Piera Carla Cicogna [b], Francesca D'Olimpio [a], Marina Cosenza [a]

[a] Department of Psychology, Second University of Naples, Italy
[b] Department of Psychology, University of Bologna, Italy

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ABSTRACT

The aim of this study was to investigate the role of global/local processing style, field-(in)dependence, and personality disorder traits in event-based prospective memory performance. One hundred and fifty participants took part in an experiment, where they were administered a computerized version of Navon's global–local task. The PM task required participants to press a designated key whenever a blue compound stimulus was presented. Participants were then administered measures of field-(in)dependence and personality disorder traits. Data were submitted to logistic regression and hierarchical regression, separately for the two conditions (global/local). Results indicated that with respect to condition, global/local processing style, field-(in)dependence, and specific personality disorder traits differently affect PM performance.

1. Introduction

Prospective memory (PM) refers to memory for delayed intentions, such as remembering to turn off the oven after 10 min, or to give a message to your colleague when you see them.

Prospective memory researchers have found it useful to distinguish between time-based and event-based tasks (Einstein & McDaniel, 1990, 1996; McDaniel & Einstein, 1993). Time-based tasks are those in which either a particular time or a particular amount of elapsed time indicates when it is appropriate to execute the intended action, while event-based tasks are tasks that must be performed when a specific target event occurs in the environment.

According to the multiprocess model (McDaniel & Einstein, 2000), prospective memory cues vary in their degree of *focality* with respect to the ongoing activity: there are cues that overlap with the information constellation relevant to performing the ongoing task, and cues that are present in the environment but not part of the information being considered by the person. The former are labeled *focal* cues, the latter *nonfocal* cues (McDaniel, Einstein, & Rendell, 2008).

The likelihood of fulfilling a prospective memory intention varies due to a host of variables. In general, successful performance depends on the nature of the PM task, on the cost of the ongoing activity and on the characteristics of the PM cue. However, successful retrieval depends also on cognitive, metacognitive and personality variables. Thus far, with the exception of age and partly motivation (PM task importance), the relationship between individual differences and prospective memory remains a neglected area of investigation (McDaniel & Einstein, 2007). However, the few existing studies have clearly demonstrated that cognitive abilities, cognitive styles, and personality characteristics affect PM performance. For example, two recent studies (Brewer, Knight, Marsh, & Unsworth, 2010; Rose, Rendell, McDaniel, Aberle, & Kliegel, 2010) indicated that working memory ability is predictive of PM performance when tasks demand more from controlled attentional processes. Senese, Nigro, Cicogna, Cosenza, and Sergi (2007) found that individuals who are more field-independent are faster in detecting a cue when it is masked in a context. Other research has reported associations between PM performance and emotional states (Kliegel & Jäger, 2006), personality traits (Cuttler & Graf, 2007, 2009; Goschke & Kuhl, 1996; Heffernan & Ling, 2001; Salthouse, Berish, & Siedlecki, 2004; Searleman, 1996), or personality disorders (Altgassen, Henry, Bürgler, & Kliegel, 2011; Altgassen, Kliegel, & Martin, 2009; Marsh et al., 2009; Racsmány, Demeter, Csigó, Harsányi, & Németh, 2011; Rude, Hertel, Jarrold, Covich, & Hedlund, 1999).

With the exception of older studies, most research cited above found that the effects of individual characteristics on PM are more prominent in tasks that require monitoring for successful retrieval.

However, other individual characteristics that might affect PM performance have not been explicitly targeted for study until now. One open question is whether and (if so) to what extent event-based prospective remembering can be affected by visual perceptual style. Dobbs and Reeves (1996) wrote: "When monitoring for an event, perceptual attributes of the cue becomes

* Corresponding author. Address: Department of Psychology, Second University of Naples, Via Vivaldi, 43, 81100 Caserta, Italy. Tel.: +39 274432; fax: +39 323000.
E-mail address: giovanna.nigro@unina2.it (G. Nigro).

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paramount. Here, what we know about problems in field dependence and other aspects of stimulus identification are relevant" (p. 220).

Even if McDaniel, Robinson–Riegler, and Einstein (1998) reported findings in support of the proposal that PM is largely conceptually driven, McGann, Ellis, and Milne (2003) demonstrated that both perceptual and conceptual processes can contribute to success on a PM task. Since perceptual and conceptual processes are so deeply intertwined that it is difficult to isolate and study them independently (Goldstone & Barsalou, 1998), it seems reasonable to assume that both bottom-up and top-down processes are involved in prospective remembering. For example, in the "faces" task used by Maylor (1993, 1996), slides of famous people were presented to participants with the instructions to name each face (ongoing task) and to circle the trial number if the person was wearing glasses (PM target event). In such a *nonfocal* task, successful performance depends first on information that is perceptual in nature, and then on the processes that recruit the semantic meaning of the stimulus. It may be that if a cue is in the visual field of the observer, but detecting it is irrelevant to the ongoing task, successful event-based PM performance depends also on the individual's ability to inspect all perceptual features of the visual scene in which the cue is embedded. For instance, in Maylor's research the attentional demands of performing the ongoing task required allocation of attentional resources to the global features of the stimuli (*the whole*), whereas the detection of prospective cues required a shift of attention to some specific details of the stimuli (*the parts*).

According to Navon (1977), "perceptual processes are temporally organized so that they proceed from global structuring toward more and more fine-grained analysis" (p. 354). This *global advantage* has been demonstrated using the so-called global–local paradigm. Several studies have indicated that, *ceteris paribus*, participants are faster in responding to the information at the global level than at the local one (*Global-Precedence*) and that conflicting information between the two levels may interfere with responses to the local level (*Global-Interference*) or with responses to the global level (*Local-Interference*).

The Global-Precedence effect, characterized by a visual bias toward global information, is dependent on both stimulus and task characteristics (Kimchi, 1992), as well as on intra- and inter-individual characteristics. Individual variations in the drive for Global-Precedence were first shown by Witkin, who coined the terms *field-dependence* and *field-independence* to classify such interindividual differences (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). More recently, Poirel, Pineau, Jobard, and Mellet (2008) demonstrated that an individual's bias toward the global level is linearly related to their degree of field-dependence. Yovel, Revelle, and Mineka (2005) found that obsessive–compulsive tendencies were associated with excessive visual attention to small letters. Granholm, Cadenhead, Shafer, and Filoteo (2002) found that patients with schizotypal personality disorder show an abnormally exaggerated global processing advantage, associated with a relative impairment in processing the local level elements of global–local stimuli.

On the whole, the results of these studies indicate that even if the visual information present in the physical environment is identical for all persons, the way in which people check and scan a visual scene is highly dependent on individual differences both in terms of perceptual style and personality characteristics. Given that "perceptual systems pick up information from the environment and pass it onto separate systems that support the various cognitive functions, such as language, memory, and thought" (Barsalou, 1999, p. 577), it may be useful to better understand the role of perceptual style in prospective memory and to identify to what extent personality disorder traits, and their influence on both perceptual style and prospective memory, affect the fulfillment of future intentions.

The aim of the present study was to investigate the role of global/local processing style, field-(in)dependence, and personality disorder traits in an event-based task with a *nonfocal* cue.

2. Method

2.1. Participants

One hundred and fifty (73 men, 77 women) undergraduates took part in this study. All participants were right-handed by self-report, had normal or corrected-to-normal vision, and were naive as to the purpose of the study. No participant was color-blind. Twelve participants were excluded from the data analyses due to high error rates on the Navon task. The final sample consisted of 138 participants (69 men and 69 women), with ages ranging from 18 to 30 years (M = 23.78; SD = 3.37).

2.2. Apparatus

An IBM-compatible computer running the *SuperLab 4.0* program and a 14-inch color monitor were used to administer the global–local task and to collect response accuracy and reaction times. Participants viewed the stimuli from a distance of 45 cm, which was controlled by means of a chinrest. A red adhesive label covered the "*Z*" key, and a green one covered the "*M*" key of the computer keyboard.

2.3. Stimuli

Hierarchical stimuli consisted of large "global" letters ("*H*" or "*T*") composed of smaller "local" letters. Following Yovel et al. (2005) procedure, the stimuli were black and appeared on a white background.[1] They were consistent (the same target letter appeared at both the global and the local levels; e.g., a big *T* made out of small Ts), inconsistent (different target letters appeared at the two levels; e. g., a big *T* made out of small Hs), or neutral (the unattended level was not a target letter; e.g., a big *H* made out of small rectangular shapes or a big rectangle made out of small Hs).

2.4. Procedure

Participants were invited to the laboratory to take part in a study on visual perception. Participants were tested individually. The computerized version of the Navon task consisted of two parts, in which participants had to pay attention to the global or local features of the stimuli, while ignoring the other level. Seven blocks of six different types of stimuli were presented in each part of the task.

At the beginning of each part, participants performed 24 practice trials. The experimental phase consisted of 42 trials in each part. The order of the global and local parts of the task was counterbalanced across participants. The PM task was embedded in the primary task. The target event consisted of a neutral light blue compound stimulus (a *nonfocal* cue[2]) that appeared once in the first part of the computerized task (namely, after the first 12 trials). Participants were assigned to two experimental conditions (global/local), which varied according to the part of the Navon task in which the target event appeared.

[1] We are very grateful to Dr. Iftah Yovel, who sent us the stimuli and other precious material.

[2] The PM task and the ongoing task demanded that stimuli were processed in qualitatively different ways. Indeed, the features processed to identify the letters did not depend on considering the color of the compound stimuli. In this sense, the target cue was *nonfocal*.