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Monitoring processes and metamemory experience in patients with dysexecutive syndrome☆

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Abstract

The aim of the present study was to determine whether monitoring measures are differentially disturbed in dysexecutive patients after frontal lesions. Twelve dysexecutive patients and 12 healthy controls were administered a paired-associates learning task. Their performances on recall prediction, judgment-of-learning (JOL), and feeling-of-knowing judgment (FOK) were then compared. The results revealed that the two groups differed only on accuracy measures of the FOK paradigm. The study of the overall correlations between the three measures of metamemory revealed a significant relation between recall prediction and accuracy measures of the JOL. We failed to find any significant correlation with the accuracy measures of the FOK. Taken together, our data confirm that metamemory experience is not a unitary construct but rather a group of distinct and quite independent mechanisms.

Keywords: Metamemory experience; Monitoring processes; Dysexecutive syndrome

1. Introduction

Metamemory refers to the knowledge of one's own memory capabilities and the strategies involved in memory performance. Flavell (1979) proposed a distinction between metacognitive knowledge, which refers to the knowledge or beliefs about the general characteristics of memory functioning, and metacognitive experience, which refers to the knowledge of the proprieties of one's own memory.

Nelson and Narens (1990) proposed a theoretical framework that specifies the role played by metamemory experience during the different learning stages (acquisition–retention–retrieval), in the description of the temporal succession of these stages and in the distinction between the processes of monitoring and control. This model is based on a distinction between the metacognitive level (*metalevel*) and the cognitive level (*object level*) and the flow of information between these levels that gives rise to monitoring and control. The notion of control implies that the *metalevel* modifies the *object level* (this could lead to the initiation of an action, its progress or its stopping). On the other hand, the notion of monitoring means that the *metalevel* is kept informed by the *object level*. Nelson and Narens (1990) also detailed and reviewed the most frequently used metamemory paradigms in the assessment of monitoring and control processes.

In accordance with this model, different measures could be distinguished according to the stage or level

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of information memorizing (for instance, acquisition stage: Judgment-Of-Learning and Recall Prediction; retrieval stage: Feeling-Of-Knowing). A common method for measuring monitoring accuracy is to ask subjects to make predictions about how accurate they will be in recalling each studied item in an upcoming memory test.

Two different kinds of predictions have been frequently elicited: global predictions (recall prediction), in which subjects judge how many items of an entire study list they will subsequently recall, and item-by-item predictions, in which subjects predict the likelihood of subsequent recall separately for each item.

Two types of item-by-item monitoring have been assessed, judgement-of-learning (JOL), in which predictions are made about the likelihood of subsequent recollection of recently studied items, and feeling-of-knowing (FOK), in which predictions are made about the likelihood of subsequent recognition of non-recalled information.

Few studies have addressed the topic of monitoring processes in dysexecutive patients. The available data (clinical observations, questionnaires, FOK paradigm, and case studies) tend to demonstrate that metamemory impairments or lack of awareness of memory could be associated with frontal lobe lesions (Janowsky, Shimamura, & Squire, 1989). Thus, in the available studies, dysexecutive patients experience difficulties when they have to predict their future performances, as they are overestimated (Kennedy & Yorston, 2000). In addition, this group of patients is found to be less accurate on the FOK paradigm (Janowsky et al., 1989).

Fernandez-Duque, Baird, and Posner (2000) proposed that the poor performances of brain-injured patients on the feeling-of-knowing judgment paradigm could be attributed to a possible impairment on judgment-of-learning and other metamemory processes. So, when general metamemory impairments were reported, it was nearly always on the basis of only one screening measure (FOK or Recall Prediction). To our knowledge, few studies have examined the functioning of one specific metamemory process (monitoring or control) by the combined use of various measures in patients with dysexecutive syndrome.

2. Purpose

The aim of the present study was to check if different monitoring measures are equally disturbed in patients with dysexecutive syndrome and frontal lesions. Based on the commentaries of Fernandez-Duque et al. (2000), it seems that testing the unitary view of metamemory processes and their selective, dissociable and discrete impairment would add to the understanding of the actual conceptions of metacognitive functioning and its relation to memory functioning.

Following Nelson and Narens (1990), the originality of the present work is in the use of three different measures of monitoring (recall prediction, JOL, and FOK) extracted from the same memory task for assessment of metamemory experience. We expected that, as compared to normal controls, dysexecutive patients would overestimate their memory abilities (Kennedy & Yorston, 2000); their recall prediction index will differ from that of the control group. Patients would also fail to show a differential JOL (Fernandez-Duque et al., 2000). This means that all the items (the easy and the difficult) would be estimated in the same manner. In normal controls, the JOL will vary as a function of the item's difficulty (high JOL scores for words with semantically related pairs but not for the neutral pairs). JOL accuracy scores of patients will not parallel their effective performances in cued delayed recall (Fernandez-Duque et al., 2000). Finally, as for JOL scores, FOK judgments of patients will be less accurate than those of normal controls and non-predictive of their productions in the recognizing phase of the memory task (Janowsky et al., 1989).

3. Method

3.1. Subjects

Twelve dysexecutive patients (mean age: 33.2 years; *SD*: 12.9; range: 20–57) and 12 controls (mean age: 33.4 years; *SD*: 12.7; range: 20–58) participated in this study. Mean numbers of years of schooling in the dysexecutive group and control group were 9.9 (2.7) and 11 (3.2), respectively. All patients had frontal lobe lesions (CT scan) of different aetiologies (vascular 17% and traumatic 83%) and a dysexecutive syndrome diagnosed by a battery of executive tests (Stroop Test, Modified Card Sorting Test, Trail Making Test, Tower of London, Hayling Sentence Completion Test, Brixton Spatial Anticipation Test, and Behavioural Assessment of the Dysexecutive Syndrome Battery). Patients were included when they were impaired at least on two executive tests. Dysexecutive patients were matched to control subjects on the basis of their age ($t(22) = .03$, $p > .05$) and education level ($t(22) = .88$, $p > .05$).

3.2. Procedure

The procedure was similar to the one used in much previous metamemory and episodic memory research, with the exception that three different measures of "monitoring" (recall prediction, judgment-of-learning, and feeling-of-knowing judgment paradigm) were computed on the basis of performances from a single experimental memory task.

Subjects were tested individually in a quiet testing room. They were informed that they would be studying