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# Test anxiety and metamemory: general preference for external over internal information storage

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## Abstract

Substantial evidence suggests that test anxiety is associated with poor memory performance. The relationship between test anxiety and metamemory, however, has remained largely unexplored. The present study examines test anxiety and metamemory from the perspective of storage selection in extended memory systems. A sample of 56 university students with scores in the upper or lower thirds of the distribution for the Test Anxiety Inventory were presented with sentences describing everyday tasks under conditions where low and high importance was attached to future remembering. For each sentence, participants indicated whether they would choose internal memory storage (neurophysiological memory) or external storage (external memory aids) to remember the information. Results showed that test-anxious participants displayed a general preference for external over internal storage, independent of the importance attached to remembering. Low estimated success of internal storage emerged as a potential reason for this preference. Implications of these findings for research on test anxiety, metamemory, and storage selection in extended memory systems are discussed. © 2001 Elsevier Science Ltd. All rights reserved.

*Keywords:* Test anxiety; Memory; Memory aids; Metacognition

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## 1. Introduction

Substantial evidence accumulated over the last 25 years suggests that test anxiety is associated with poor memory performance (for reviews, see Eysenck, 1979; Mueller, 1992; Zeidner, 1998).

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According to cognitive models of anxiety and performance (Eysenck, 1992), test-anxious individuals show impaired performance because part of their working memory is occupied with task-irrelevant thoughts such as worries about performance and thoughts about failure, leading to inferior performance in memory tasks.

Whereas the relationship between test anxiety and memory is well documented (e.g., Hembree, 1988), only very little is known about the relationship between test anxiety and metamemory (Zeidner, 1998). The concept of metamemory was first introduced by Flavell (1971) and later defined as the “individual’s knowledge of and awareness of memory, or of anything pertinent to information storage and retrieval” (Flavell & Wellman, 1977, p. 4). Thus, metamemory comprises not only knowledge about one’s own memory (such as knowledge about the strengths and weaknesses of one’s memory) but also knowledge about ways and means to compensate for potential weaknesses, including knowledge of mnemonically relevant parts of the external world such as external memory aids.

Following Flavell’s broad conception of metamemory, Schönplflug and Esser (1995) introduced the concept of “extended memory systems”. Traditional views on human memory have restricted memory to internal (neurophysiological) memory. According to Schönplflug and Esser, however, memory is more than what people can keep in their heads. Instead, human memory is an extended and interrelated system of internal memory combined with various external memory stores. These include not only written records (e.g., notes), but also non-verbal cues (e.g., the classic “knot in your handkerchief”)<sup>1</sup> and other individuals (e.g., one’s secretary).

Within the framework of extended memory systems, one important question concerns storage selection: How do individuals decide whether to use internal memory or external memory to store a new piece of information? According to the theory and research of Schönplflug and Esser (1995; Esser, 1996, 1998; Schönplflug, 1986a, 1986b), three parameters are crucial when evaluating internal and external storage, namely (a) the importance of remembering the information, (b) the estimated likelihood of successful remembering of the information when using internal memory vs external memory aids, and (c) the estimated effort of storing the information internally vs externally. If remembering a piece of information is of great importance, individuals generally prefer external storage over internal storage. Otherwise, individuals estimate the success and effort associated with internal vs external storage and choose the storage method with the higher likelihood of successful remembering or with the lower effort of storing.

The aim of the present study was to explore metamemory in test anxiety by investigating preference for internal vs external storage for sentences under conditions where low and high importance was attached to remembering. Research on test anxiety and memory has demonstrated that test-anxious individuals have poorer (internal) memory than individuals low in test anxiety. Thus, for highly test-anxious individuals, the likelihood of successful remembering when using internal storage should be lower compared to individuals low in test anxiety. Consequently, following Schönplflug and Esser’s predictions, test anxiety should be associated with a general preference for external over internal storage of information.

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<sup>1</sup> In the US, this would correspond to “string around your finger”.

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