

## 摘要

在多任務處理的研究領域，多任務同時處理和任務轉換的關係是一個重要的課題。然而，這課題並沒受到充分研究。即使僅有的相關研究沒有統一的結論，有些研究在談及多任務處理時，仍假設了普遍的多任務處理因素的存在。本研究採用了個體差異方式去調查多個多任務同時處理和任務轉換的範式之間的關係。本研究採用了六個具代表性的多任務處理範式，並對二百二十名參與者進行測試。這六個多任務處理範式分別為心理不應期範式、雙任務範式、任務轉換範式、雙線索對單任務的任務轉換範式、含有問題狀態要求的任務轉換範式及模擬駕駛範式。其後，本研究採用探索性因素分析對實驗所得的矩陣進行分析，並提取了三個多任務處理的共通限制。這三個限制為產生式規則測試、任務設置提取及任務設置重構；且分別和螺旋紋認知框架中的中央程序資源、陳述模塊及目標緩衝區相聯繫。進一步的相關分析發現，產生式規則測試成本和處理速度及玩電子遊戲經驗呈負相關；任務設置提取和智力、處理速度及工作記憶容量呈負相關；任務設置重構和工作記憶容量呈負相關。本研究亦對多任務處理的性別差異進行分析並發現男性在產生式規則測試方面比女性更為有效率，而女性則在任務設置提取及任務設置重構方面展現一定優勢。綜合而言，本研究結果指出沒有一個普遍的多任務處理因素存在，而這三個多任務處理的限制不能以範式去分類。研究者在進行多任務處理研究、多任務處理能力評估及多任務處理訓練前，必須充分了解並納入這三個多任務處理的限制因素。

## Abstract

The relationship between concurrent multitasking and task switching has been an important question receiving relatively little attention. Empirical findings regarding this question were inconsistent but some studies simply assumed the existence of a general multitasking limitation when they were referring to multitasking performance. The present study adopted an individual differences approach to examine the relations among multiple paradigms of concurrent multitasking and task switching. Participants ( $N = 220$ ) were tested on six multitasking paradigms including a Psychological Refractory Period paradigm, a dual-task paradigm, a simulated driving paradigm, a typical task-switching paradigm, a task-switching paradigm with 2:1 mappings between cues and tasks, and a task-switching paradigm with problem states requirement. After discarding the data from 19 outliers, the correlation matrix ( $N = 201$ ) of ten multitasking costs was used for an Exploratory Factor Analysis. Three common processing limitations were extracted and interpreted as processing limitations in production rule testing, task-set retrieval, and task-set reconfiguration. The three multitasking limitations appeared to be respectively associated with the limitations of the central procedural resource, the declarative module, and the goal buffer described in the threaded cognition framework. Further correlation analyses with secondary measurements found that the production rule testing cost was negatively correlated with processing speed and video game playing experience; the task-set retrieval cost was negatively correlated with intelligence, processing speed, and working memory capacity; and the task-set reconfiguration cost was negatively correlated with working memory capacity. Gender differences in multitasking were also examined, and males were found to outperform females in efficiency of production rule testing

while, females showed a trend with lower costs in task set retrieval and reconfiguration. Results suggest that a general multitasking factor may not exist and the three factors were not organized according to paradigms, as a dual-task paradigm could also involve task set retrieval costs. Researchers should take into considerations of all the three aspects of multitasking in conducting research, assessing multitasking abilities, and delivering multitasking training.