

The problem state: A cognitive bottleneck in multitasking.
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The main challenge for theories of multitasking is to predict when and how tasks interfere. Here, we focus on interference related to the problem state, a directly accessible intermediate representation of the current state of a task. On the basis of Salvucci and Taatgen's (2008) threaded cognition theory, we predict interference if 2 or more tasks require a problem state but not when only one task requires one. This prediction was tested in a series of 3 experiments. In Experiment 1, a subtraction task (rekenen, aftrekken) and a text entry task had to be carried out concurrently. Both tasks were presented in 2 versions: one that required maintaining a problem state and one that did not. A significant overadditive interaction effect was observed, showing that the interference between tasks was maximal when both tasks required a problem state. The other 2 experiments tested whether the interference was indeed due to a problem state bottleneck, instead of **cognitive load** (Experiment 2: an alternative subtraction and text entry experiment) or a **phonological loop** bottleneck (Experiment 3: a triple-task experiment that added phonological (klanken van de taal) processing). Both experiments supported the problem state hypothesis. To account for the observed behavior, computational cognitive models were developed using threaded cognition within the context of the cognitive architecture ACT-R (Anderson, 2007). The models confirm that a problem state bottleneck can explain the observed interference. (PsycINFO Database Record (c) 2016 APA, all rights reserved)