Self-structured management of multiple tasks in complex environments

In everyday life and at work, we often face situations in which we have to manage multiple tasks at the same time. However, the circumstances and requirements of these situations can vary greatly. There are externally structured situations, in which clear directives and processes determine actions, and self-structured situations, in which people can prioritise and structure the tasks themselves. Managing both types of situations require the use of executive functions – albeit in different degrees and constellations. The empirical study of both types of situations is also associated with different challenges for experimental control (Arrington et al., 2014; Arrington & Logan, 2004).

The field of cognitive psychology has already dedicated significant research efforts to the question of how people manage multiple tasks. The executive functions underlying this human ability and the factors influencing the resulting performance have been examined in strictly controlled laboratory experiments in this field of research. The extant research has revealed a variety of significant empirical phenomena (e.g., Janczyk, 2016; Vandierendonck et al., 2010). However, this research area usually applies experimental paradigms that reduce the complexity of reality and precisely prescribe the procedures for processing the paradigm in terms of timing and task sequence, leaving little room for individual approaches. This ensures a highly experimentally controlled examination of the management of multiple tasks in externally structured. However, the reflection and investigation of self-structured situations is hardly possible with these paradigms. Human factors research often employs research designs that mirror the complexity and decision-making autonomy of people in real, self-structured situations (e.g., Peifer & Zipp, 2019; Strayer & Johnston, 2001). Nevertheless, the high level of complexity of these research approaches compromises experimental control and hinders the derivation of precise conclusions about the management of multiple tasks, as behaviour is influenced by various variables and interactions (Keizer et al., 2014; Tunnell, 1977). Thus, experimentally controlled studies on the management of multiple tasks in self-structured situations are currently largely missing.

The aim of my dissertation is to reduce the identified gap in research. For this purpose, I will introduce a novel paradigm that extends the experimentally controlled paradigms of cognitive psychology while maintaining satisfactory experimental control by increasing the complexity and degrees of freedom for task processing, inspired by previous human factors research. I will examine the procedure for managing multiple tasks in the novel paradigm, the flexibility of behaviour and factors influencing free behaviour in a series of three empirical studies on human participants.

In Study I, I examined how participants processed the novel paradigm and whether known effects from research on the management of multiple tasks in externally structured situations, more precisely on task switching behaviour, also appear in the self-structured paradigm. The results showed that most participants processed the paradigm in a highly structured and consistent way, typically applying one of two self-selected strategies. The observation of different processing strategies highlights that individuals handle multiple tasks differently when given more freedom – a phenomenon not observable in rigidly structured paradigm. This underscores the additional value of studying multiple task management under conditions that demand greater self-organization. Furthermore, I replicated several typical effects from externally structured task switching behaviour in the self-structured paradigm, though not all expected effects emerged. This partial overlap suggests that transferring findings from external structured to more open situations is not straightforward, and points to the need for further research on which effects can be generalised and why discrepancies arise.

In Study II, I investigated the flexibility of the strategies identified in Study I for self-structured processing of multiple tasks. Therefore, I determined how strongly individual preferences influence strategy choice and how the external specification of a strategy to be used for processing the paradigm affect performance. For this purpose, I adapted the previously developed paradigm so that participants were either free to choose their strategy or instructed to follow a pre-defined one. The results showed that participants differed in how much they adapted their strategy after an external strategy instruction: while some reverted to their initial preference once the strategy instruction was removed, others continued which the instructed processing approach. This suggests that both stable personal tendencies and external specifications shape strategy choices. Additionally, although there were no general differences in performance between the two strategies, participants who had to apply a strategy that did not fit their preference

showed greater performance difficulties. These findings indicate that managing multiple tasks is not entirely flexible and at least partly constrained by individual preference. Forcing individuals to abandon their preferred approach can impair performance.

In Study III, I examined how the self-structured management of multiple tasks is affected by the additional occurrence of interruptive tasks and which factors at the individual level influence the processing of the paradigm. The results confirmed that the two strategies for managing the self-structured paradigm identified in Study I and Study II remained stable, even when interruptions occurred. Additionally, the results provided initial evidence that this choice of strategy is associated with the sensitivity of the behavioural inhibition system, polychronicity and working memory capacity, i.e., stable personality dispositions and cognitive abilities. The processing of interruptive tasks slightly varied over time, with earlier processing observed when interruptive tasks were novel, evaluated positively and processed correctly. Thus, a joyful anticipation can be observed as important factor influencing the more fluctuating strategies for processing the interruptive tasks. In sum, Study III provided new insights into the management of multiple tasks and factors influencing behaviour in self-structured situations.

In conclusion, my dissertation extends previous research on the management of multiple tasks by introducing a novel promising possibility to studying this ability in self-structured situations. I demonstrated that behaviour in self-structured situations shows both similarities and differences compared to externally structured situations. In addition, I revealed that individuals in self-structured situations adopt stable self-selected processing strategies to manage multiple tasks, influenced by various factors at the individual level. Furthermore, when individuals are forced to follow a strategy that does not align with their preferences, performance deterioration can result. Thus, my dissertation emphasizes the importance of the complementary investigation of the management of multiple tasks in self-structured environments and highlights the often overlooked role of self-selected strategies in these situations. Therefore, my dissertation constitutes a promising initial step in extending research on the management of multiple tasks in self-structured situations and will help to inspire and improve future research on the management of multiple tasks.

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