



When frequent media multitaskers perform worse and when they do not: The role of self-regulation ability and strategy manipulation

Ewa Szumowska^a, Agnieszka Popławska-Boruc^b, Jakub Kuś^{c,*}, Małgorzata Osowiecka^b, Justyna Kramarczyk^d

^a Jagiellonian University in Krakow, Institute of Psychology, Department of Philosophy, Ingardena Str. 6, 30-060, Krakow, Poland

^b SWPS University of Social Sciences and Humanities, Faculty in Sopot, Polna Str. 16/20, 81-745, Sopot, Poland

^c SWPS University of Social Sciences and Humanities, Faculty of Psychology in Wrocław, A. Ostrowskiego Str. 30B, 53-238, Wrocław, Poland

^d Adam Mickiewicz University in Poznan, Institute of Sociology, Faculty of Social Sciences, Szamarzewskiego Str. 89, 60-568, Poznań, Poland

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ABSTRACT

Ophir, Nass and Wagner (2009) showed that as multitasking frequency increases, multitasking performance decreases. Other studies, however, have not replicated this effect (e.g., Minear, Brasher, McCurdy, Lewis & Younggren, 2013). In this paper, we argue that the association between frequent media multitasking and poor multitasking performance depends on self-regulation ability and external factors, such as manipulation of the task execution strategy (sequential vs. free switching). In Study 1, we determined participants' media multitasking frequency and measured their self-regulation ability. Then, participants performed a multiple media task in which they could freely switch between browser tabs. The results showed that high media multitasking levels were associated with more switches between tabs but only for participants with low (but not high) self-regulation ability. No differences in performance were observed. In Study 2, instead of measuring self-regulation ability, we manipulated task execution strategy (as an external form of regulation). As predicted, media multitasking frequency and performance on multiple tasks (overall score) were negatively related only in the free switching condition and not in the sequential condition. The results elucidate the relationship between media multitasking frequency and multitasking performance by showing its boundary conditions, and they help explain contradictory findings in the media multitasking literature.

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1. Introduction

Due to the growing importance of new technologies in everyday life and the use of multiple data sources, the potential impact of media multitasking on human behaviour has been under scrutiny for years. Studies have shown that media multitasking has become a predominant media-use behaviour, particularly among adolescents (Brown & Cantor, 2000; Jacobsen & Forste, 2011; Roberts, Foehr, & Rideout, 2005; Voorveld & van der Goot, 2013; Wood et al., 2012). This growing prevalence of media multitasking has negative consequences for cognitive functioning. One popular

study by Ophir et al. (2009) showed that compared with light media multitaskers (LMMs, or those low in media multitasking frequency), heavy media multitaskers (HMMs, or those high in media multitasking frequency) were, in fact, worse at multitasking and exhibited difficulties in key areas of cognitive control, such as task switching, filtering, and working memory management. However, other studies (e.g., Alzahabi & Becker, 2013; Minear et al., 2013) did not find a negative relationship between frequent media multitasking and multitasking performance.

In this paper, we argue that the association between frequent media multitasking and poor multitasking performance depends on self-regulation ability and external factors, such as manipulation of the task execution strategy. Ophir et al. (2009) argued that the performance decrements HMMs exhibit might stem from a weak ability to filter out irrelevant, extrinsic stimuli and to ignore unimportant task sets. Therefore, differences in self-regulation (cognitive control) might play an important role in the behaviour of HMMs. Other studies have also shown that individuals who are

* Corresponding author. SWPS University of Social Sciences and Humanities, Faculty of Psychology in Wrocław, A. Ostrowskiego Str. 30B, 53-238, Wrocław, Poland.

E-mail addresses: ewa.szumowska@uj.edu.pl (E. Szumowska), apoplawska1@swps.edu.pl (A. Popławska-Boruc), jkus@swps.edu.pl (J. Kuś), mosowiecka@swps.edu.pl (M. Osowiecka), jkra@amu.edu.pl (J. Kramarczyk).

low in self-regulation (high in impulsivity) are more inclined to multitask with media (Minear et al., 2013; Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013). These individuals might thus be more likely to exhibit performance decrements related to frequent media multitasking.

We therefore postulated that self-regulation might be an important factor that modulates the relationship between media multitasking frequency and multitasking performance. Specifically, we predicted that high-frequency media multitasking would be related to more task switches and poorer multitasking performance but only for participants who were low in self-regulation ability. By contrast, we expected that participants who were high in self-regulation ability would display no performance decrements. Furthermore, we expected to find similar results when participants' behaviour was regulated externally (e.g., through the manipulation of the task execution strategy) rather than internally.

The studies shed new light on the relationship between media multitasking frequency and multitasking performance by showing its boundary conditions. They also help explain why some studies (e.g., Sanbonmatsu et al., 2013, Ophir et al., 2009) but not others (e.g., Minear et al., 2013) have observed this relationship. The findings also have implications for how to best design work environments in order to prevent the performance losses that frequent media multitaskers are prone to in computer-based multitasking.

2. Theory

2.1. Media multitasking

In general, media multitasking is defined as engagement in several simultaneous activities, at least one of which must be media related (Poplawska, Osowiecka, & Kramarczyk, 2015; Vega, 2009; Zhang, Jeong, & Fishbein, 2010). It might occur on various devices (e.g., using the Internet on laptop and listening to radio) or on a single device, for example, on a computer screen with multiple browser tabs open (Kononova & Chiang, 2015; Lau, 2017; Yeykelis, Cummings, & Reeves, 2014). Furthermore, media multitasking can involve different types of media, including traditional media (e.g., television, radio, newspapers) or new media (internet tools/mobile devices such as laptops, smartphones or tablets; Viitanen, Westman, Kinnunen, & Oittinen, 2012). Some researchers view the majority of computer use as media multitasking (Carrier, Cheever, Rosen, Benitez, & Chang, 2009) and therefore treat computer-based multitasking as a separate category (Benbunan-Fich, Adler, & Mavlanova, 2011; Zhang & Zhang, 2012).

Research has broadly described media multitasking in relation to three main areas: its patterns (Adler & Benbunan-Fich, 2013; Kononova, Alhabash, Park, & Wise, 2012; Rideout, Foehr, & Roberts, 2010), motivations (Kononova & Chiang, 2015; Leung, 2001) and effects (Bowman, Levine, Waite, & Gendron, 2010; Junco & Cotten, 2011; Wang et al., 2012). Studies in the first category mainly focus on what media activities tend to take place concurrently, when and where media multitasking occurs and how people multitask (e.g., parallel vs. interleaved multitasking; Adler & Benbunan-Fich, 2012). Studies in the second category focus on motives, including internal and external – or personal and social – factors that drive multitasking behaviour (Viitanen et al., 2012). Specifically, researchers have observed individual differences in multitasking preferences (Lindquist & Kaufman-Scarborough, 2007), multitasking willingness and the frequency of engagement in multitasking in general and media multitasking in particular. Studies in the third category focus on the outcomes of media multitasking, that is, the consequences of frequent media for a person's cognitive and social functioning (e.g., Bowman et al., 2010; Jeong, Hwang, & Fishbein, 2010; Levine, Waite, & Bowman, 2007;

Pool, Koolstra, & van der Voort, 2003; Salvucci & Macuga, 2002). In the current paper, we focus on the third category and examine how reported media multitasking frequency relates to multitasking performance.

2.2. Frequency of media multitasking and multitasking performance

In a popular study, Ophir et al. (2009) examined the relationship between media multitasking and cognition. Their results demonstrated that HMMs have much more difficulties than LMMs in key areas of cognitive control, such as task switching, filtering, and working memory management. The study showed that HMMs were more susceptible to distraction and had greater difficulty filtering out irrelevant, extrinsic stimuli. Moreover, HMMs were less effective in ignoring unimportant task sets, and according to Fox, Rosen, and Crawford (2009), they needed more time to carry out given tasks. Ophir et al. (2009) thus demonstrated an intriguing multitasking paradox: people who multitask to the greatest extent are also those who are affected the most by the cognitive costs of switching between tasks.

Sanbonmatsu et al. (2013) also showed that multitasking activity, measured by the Media Multitasking Inventory and self-reported cell phone usage while driving, was negatively correlated with actual multitasking ability, which was operationalized as performance on the Operation Span task. In line with the findings of Ophir et al. (2009), these results indicate that the people who are most likely to engage in multiple tasks simultaneously are not the people who are most capable of multitasking effectively.

Other studies, however, have failed to replicate these effects. In their study, Minear et al. (2013) tested HMMs and LMMs on measures of attention, working memory, task switching, and fluid intelligence. They also measured their self-reported impulsivity and self-control. They found that people who reported engaging in heavy amounts of media multitasking (HMMs) reported being more impulsive and performed more poorly on measures of fluid intelligence than did those who did not frequently engage in media multitasking (LMMs). However, they did not find evidence to support the contention that HMMs are worse in multitasking situations, such as task switching, or that they show deficits in dealing with irrelevant or distracting information (compared with LMMs).

Similarly, a recent study by Alzahabi and Becker (2013) reported that compared with LMMs, HMMs were not worse at dual-task performance and were in fact better at shifting between tasks. The authors were also unable to replicate Ophir et al. (2009) findings despite using identical task paradigms.

The abovementioned contradictory findings suggest that the relationship between media multitasking frequency and multitasking performance is a complex one, and some additional factors might influence it. We here argue that media multitasking frequency and multitasking performance are negatively related but only when behaviour regulation (understood as either a person's ability or a situational factor) is low. We thus propose a candidate-moderating variable.

2.3. (Self-) regulation and multitasking performance

Self-regulation, often used interchangeably with self-control, is the ability to control one's attention and behaviour in relative autonomy from external pressures, innate and learned automatisms, and physiological impulses (Baumeister & Tierney, 2011; Krug & Carter, 2011; Muraven & Baumeister, 2000; Nećka, 2005). It manifests itself in the capacity to postpone gratification and override automatic or habitual response tendencies (Bauer & Baumeister, 2011; Nećka, 2005), and it is necessary for successful

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