

# The Mediating Role of Mindfulness in the Relationship between Media Multitasking and Mind Wandering

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## ABSTRACT

Commonly regarded as a marketable skill in the modern, technology-rich world, the-now-ubiquitous behavior of media multitasking (i.e., engaging in more than one medium at the same time) usually comes with various costs, including lowered task performance, prolonged task completion time, and frequent attentional lapses. This correlational study examined the mediating effect of self-reported trait mindfulness in the relationship between self-reported media multitasking frequency and mind wandering tendency. The mediation analysis revealed that trait mindfulness partially mediated the relationship between media multitasking frequency and mind wandering tendency. This partial mediation model suggests that habitual media multitasking is associated with an increased proclivity for mind wandering and that media multitasking is associated with lower levels of mindfulness, which is in turn associated with greater propensity for mind wandering. It is plausible that habitual media multitaskers may find it difficult to prevent their minds from wandering because their top-down attentional control is compromised by frequently and consistently switching attention between multiple forms of media, diminishing their ability to stay focused on a single task. The findings from the current study emphasize the importance of taking a step back and reconsidering our relationship with technology. Through chronic media multitasking, we might be training our brains to easily get distracted by both internal and external interruptions, depriving ourselves of our innate ability to stay present and deteriorating our ability to stay focused.

## CCS CONCEPTS

Human-centered computing -- Empirical studies in HCI

## AUTHOR KEYWORDS

Media multitasking, mind wandering, mindfulness, wandering mind, media multitasking and mind wandering.

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## INTRODUCTION

“As we distribute ourselves, we may abandon ourselves” Turkle

This quote, taken from Sherry Turkle’s introduction to her seminal book, *Alone Together*, succinctly and remarkably illustrates our penchant for simultaneously engaging in multiple types of media, or media multitasking [1]. In the high-tech, digital world we live in, it is not unusual to come across people who pride themselves on their tremendous ability to media multitask. Although many individuals tend to believe that they are good at multitasking in general and media multitasking in particular, previous research suggests that what they are actually doing is rapidly switching attention from one form of media to another [2]. The harmful effects of this rapid task-switching behavior have been well documented [3].

In their pioneering study regarding the effect of media multitasking on attentional control, Ophir et al. devised a media multitasking index (MMI) to measure media multitasking frequency across various types of media and investigated the role of media multitasking in attentional control [4]. The MMI was used to categorize participants into heavy media multitaskers (HMM) and light media multitaskers (LMM). Ophir et al. found that the performance of HMMs on a task-switching paradigm was poorer than that of LMMs and that HMMs demonstrated an increased susceptibility to interference from task-irrelevant stimuli during a filtering task. Ophir et al. concluded that HMMs had a greater proclivity for bottom-up attentional control, directed by environmental stimuli, and that they tended to process information in an exploratory manner, focusing on broader aspects rather than details. In contrast, LMMs were reported to demonstrate a greater tendency for top-down attentional control, allowing them to better focus and sustain attention on a single task in the face of interference.

Subsequent studies have produced mixed results regarding this account of media multitasking and its deleterious effects on attentional control. Cain and Mitroff and Sanbonmatsu, et al. provided further support for the view that when compared to LMMs, HMMs tend to suffer from performance decrements during demanding cognitive tasks due to their wider attentional focus and decreased ability to suppress distractions [5, 6].

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Nonetheless, Alzahabi and Becker demonstrated that HMMs outperformed their LMM counterparts in a task-switching paradigm and that the performance of HMMs and LMMs did not differ on a dual-task paradigm [7]. Similarly, Minear et al. showed that HMMs and LMMs did not differ in their ability to task-switch [8]. Taken together, previous findings regarding the role of media multitasking in attentional control are somewhat inconclusive.

## Media Multitasking, Mind wandering, and Mindfulness

Despite these mixed results, there exists some evidence for a link between media multitasking and mind wandering [9]. Mind wandering is a mental state in which attention drifts away from an ongoing task and relevant external stimuli to self-generated, internal thoughts unrelated to the task at hand [10]. This attentional state is often characterized by failures in maintaining sustained attention on the ongoing task. Daily life is replete with opportunities conducive to mind wandering. Anyone who has tried to work in the office on a bright sunny day (to prepare manuscripts for publication, for instance) can attest to the somehow inevitable experience of mind wandering. In fact, previous studies conducted in daily life settings demonstrate that people mind wander between 25% and 50% of the time [11, 12].

Although this mental experience of mind wandering has been shown to be beneficial under certain circumstances such as autobiographical planning and avoiding boredom [10], it has been associated with performance decrements on diverse tasks, including sustained attention [13], reading comprehension [14], and listening to lectures [15].

Another concept possibly related to mind wandering is mindfulness [16, 17], which involves the self-regulation of attention by dispassionately observing and attending to one's thoughts, feelings, and sensations at the present moment [18]. Trait mindfulness or dispositional mindfulness refers to the extent to which individuals demonstrate characteristics associated with mindfulness in their daily life. Trait mindfulness has been shown to be negatively associated with the propensity for mind wandering [16, 17], suggesting individuals who demonstrate high levels of trait mindfulness tend to mind wander less during demanding tasks.

While there are few studies on the relationship between mind wandering, mindfulness, and media multitasking, Ralph et al. found that media multitasking frequency was positively associated with mind wandering tendency in daily life and that it was negatively associated with trait mindfulness [9]. The authors also proposed and tested a plausible causal model in which the effect of media multitasking on mind wandering was fully mediated by trait mindfulness. Accordingly, this model predicted that media multitasking would lead to deficits in top-down attentional control and decreased levels of mindfulness, which would in turn result in greater propensity for mind wandering. Ralph et al. labeled this prediction as the deficit-producing hypothesis [9].

As pointed out before, mindfulness and mind wandering are conceptualized as opposing constructs, and trait mindfulness and

mind wandering tendency are conceived as being inversely associated [16, 17]. The current correlational examination further explored this relationship, taking into consideration media multitasking. Based on the deficit-producing hypothesis [9], it was predicted that increased media multitasking frequency would predict greater propensity for mind wandering in daily life settings, and that this relation would be partially mediated by trait mindfulness.

## METHOD

This study used a cross-sectional correlational research design to investigate the associations among self-reported media multitasking frequency, trait mindfulness, and mind wandering tendency.

### Participants

Participants were undergraduate students at a large Midwestern university in the US. A total of 233 participants (133 females) completed the measures. The mean age of these participants was 19.7.

### Materials

Participants completed an online questionnaire containing the three self-reported measures described below:

**Media Multitasking Index**. The Media Multitasking Index (MMI) includes questions regarding various media multitasking behaviors [4]. Due to time constraints, a modified version of the MMI including types of media most relevant to college students was administered. For each type of these media (i.e., watching TV or videos, surfing the Web, using social media, playing video games, reading, doing homework, and listening to lectures or presentations), participants indicated how often they engaged in that medium simultaneously while engaging in each of the other type of media, using a four-point scale. Based on participants' frequency rating for each type of media, an MMI was computed for each participant. Greater MMI scores indicated increased frequency of media multitasking. The MMI demonstrated good internal consistency in the present sample (Cronbach's  $\alpha = .92$ ).

**Mind Wandering Questionnaire**. The Mind Wandering Questionnaire (MWQ) is a 5-item, brief questionnaire used as a measure of general propensity for mind wandering, or mind wandering tendency in daily life [19]. Greater scores on the MWQ indicated greater mind wandering tendency in daily life settings. The reliability estimate for the MWQ in the present sample was good ( $\alpha = .81$ ).

**Mindful Attention Awareness Scale**. Mindful Attention Awareness Scale (MAAS) is a 15-item measure of dispositional mindfulness, focusing on trait-like aspects of mindfulness [20]. The responses to the scale items were reverse-coded and an MAAS score was calculated for each participant by averaging the responses to the items in the scale. Greater scores on the MAAS indicated greater trait mindfulness. The reliability estimate for the MAAS was good ( $\alpha = .87$ ).

## RESULTS

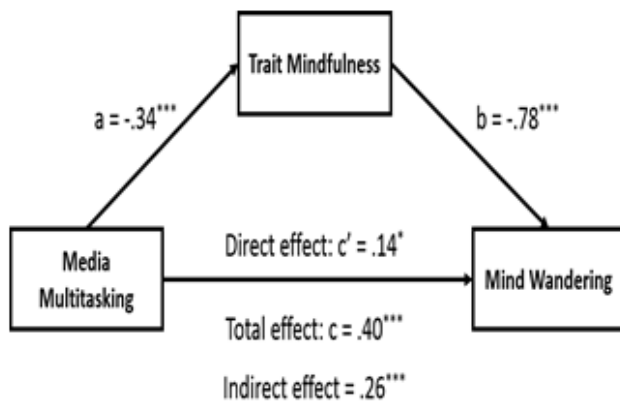
Regarding the relationship between media multitasking and mind wandering, it was expected that trait mindfulness would mediate this relationship. Specifically, it was hypothesized that self-reports of media multitasking frequency would positively predict self-reports of mind wandering tendency through self-reports of trait mindfulness and frequency of dissociative experiences such that those who media multitask more frequently would demonstrate lower levels of trait mindfulness and higher frequency of dissociative experiences, which in turn would lead to increased mind wandering tendency. To test this parallel mediation model, a bootstrapped mediation analysis was conducted using the PROCESS macro for SPSS [21]. Correlations among the variables are presented in Table 1. The results of the analysis are presented in Figure 1.

As shown in Table 1, correlations among the variables were congruent with the conceptual associations among these variables. Specifically, media multitasking frequency was positively associated with mind wandering tendency, and it was negatively associated with trait mindfulness. As expected, mind wandering tendency was negatively associated with trait mindfulness.

**Table 1: Correlations among the measures**

Measure	<i>M (SD)</i>	1	2	3
1. MWQ	3.92 (.84)	.81		
2. MAAS	3.89 (.73)	-.72**	.87	
3. MMI	2.56 (.78)	.37**	-.36**	.92

Values on the diagonal indicate the reliability estimates (Cronbach's alpha) for each measure.  $N = 232$ . \*\*  $p < .01$ .



**Figure 1: The mediating role of trait mindfulness in the relationship between media multitasking and mind wandering**

As can be seen from Figure 1, media multitasking frequency significantly predicted trait mindfulness (path a),  $b = -.34$ ,  $SE =$

$.063$ ,  $p < .001$ , 95% CI  $[-.46, -.21]$ . Media multitasking frequency alone explained 13% of the variance in trait mindfulness,  $F(1, 230) = 28.38$ ,  $MSE = .464$ ,  $p < .001$ ,  $R^2 = .13$ . Trait mindfulness significantly predicted mind wandering tendency (path b),  $b = -.78$ ,  $SE = .062$ ,  $p < .001$ , 95% CI  $[-.90, -.65]$ , and the direct effect of media multitasking frequency on mind wandering tendency was statistically significant (path c'),  $b = .14$ ,  $SE = .054$ ,  $p < .05$ , 95% CI  $[.03, .24]$ . This model for the direct effect of media multitasking frequency on mind wandering tendency (path c'), controlling for the effect of trait mindfulness (path b) explained 53% of the variance in mind wandering tendency,  $F(2, 229) = 114.07$ ,  $MSE = .335$ ,  $p < .001$ ,  $R^2 = .53$ . Lastly, the total effect of media multitasking on mind wandering tendency was statistically significant (path c),  $b = .40$ ,  $SE = .069$ ,  $p < .001$ , 95% CI  $[.26, .53]$ . Media multitasking frequency alone explained 14% of the variance in mind wandering tendency,  $F(1, 230) = 32.47$ ,  $MSE = .613$ ,  $p < .001$ ,  $R^2 = .14$ . The indirect effect of media multitasking frequency on mind wandering tendency through trait mindfulness was significant as well, indirect effect =  $.26$ ,  $SE = .052$ ,  $p < .001$ , 95% CI  $[.16, .37]$ .

Given that all paths were statistically significant, that the inclusion of trait mindfulness as a mediator led to reductions in the magnitude of the effect of media multitasking frequency on mind wandering tendency (path c' < path c), and that the indirect effect of media multitasking frequency on mind wandering tendency through trait mindfulness was significant, it can be concluded that trait mindfulness partially mediated the relationship between media multitasking frequency and mind wandering tendency. These results suggest that habitual media multitasking may lead to increased tendency to mind wander in daily life. These results also provide support for the notion that media multitasking may lead to lower levels of mindfulness, which in turn results in greater propensity for mind wandering.

## DISCUSSION AND CONCLUSION

The current study investigated the association between media multitasking frequency and mind wandering tendency as mediated by trait mindfulness. In line with Ralph et al.'s deficit-producing hypothesis [9], which suggests that media multitasking results in deficits in attentional control by increasing one's susceptibility to bottom-up control of attention, the current study revealed that trait mindfulness partially mediated the relationship between media multitasking and mind wandering. This partial mediation model suggests that habitual media multitasking is associated with increased tendency to mind wander in daily life and that increased frequency of media multitasking is associated with lower levels of mindfulness, which is in turn associated with greater propensity for mind wandering. Therefore, it is plausible that heavy media multitaskers may find it difficult to prevent their minds from wandering off because they compromise top-down attentional control by frequently and consistently switching attention between multiple forms of media, diminishing their ability to stay focused on a single task. From the perspective of the

decoupling hypothesis of mind wandering [22, 23], it could be argued that in an attempt to attend to multiple types of media, HMMs practice repeatedly decoupling attention from a single perceptual source, increasing their proclivity for bottom-up distraction. As a result, heavy media multitaskers may also have difficulty in warding off mind wandering because of their susceptibility to distraction [4], which is in this case self-distraction or mind wandering.

Although the supporting data are correlational, this causal interpretation is congruent with previous studies demonstrating heavy media multitaskers' increased susceptibility to bottom-up attentional control and superficial processing, compared to light media multitaskers [4, 5]. This interpretation is also consistent with recent findings from neuroimaging studies. Specifically, Loh and Kanai observed that HMMs had smaller gray-matter density in the anterior cingulate cortex (ACC) [24], which is strongly implicated in top-down attentional control [25] and has been shown to be positively affected by mindfulness training [26-28]. Furthermore, it has also been argued that media multitasking may lead to increased activity in the default mode network (DMN) [29], which is implicated in mind wandering [30, 31]. Hence, it is plausible that media multitasking may lead to lower levels of mindfulness (lessened activity in the ACC), which in turn results in greater propensity for mind wandering (greater activity in the DMN). Given that the current study tested this causal model based on correlational data, the extent to which this proposition is tenable remains an open area of investigation for future experimental and/or longitudinal studies.

Despite the rise of the attention economy in which tech companies are unyieldingly racing for users' attention, the findings from the current study stress the importance of taking a step back and reconsidering our relationship with technology. As we are striving to attend to more than one medium in conjunction with other media, we might be training our brains to easily get distracted by both internal and external interruptions, depriving ourselves of our innate ability to stay present and deteriorating our ability to stay focused.

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