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What else do college students "do" while studying? An investigation of multitasking

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ABSTRACT

We investigated the frequency and duration of distractions and media multitasking among college students engaged in a 3-h solitary study/homework session. Participant distractions were assessed with three different kinds of apparatus with increasing levels of potential intrusiveness: remote surveillance cameras, a head-mounted point-of-view video camera, and a mobile eyetracker. No evidence was obtained to indicate that method of assessment impacted multitasking behaviors. On average, students spent 73 min of the session listening to music while studying. In addition, students engaged with an average of 35 distractions of 6 s or longer over the course of 3 h, with an aggregated mean duration of 25 min. Higher homework task motivation and self-efficacy to concentrate on homework were associated with less frequent and shorter duration multitasking behaviors, while greater negative affect was linked to longer duration multitasking behaviors during the session. We discuss the implications of these data for assessment and for understanding the nature of distractions and media multitasking during solitary studying.

1. Introduction

For school children, the amount of schoolwork completed at home typically increases with increasing grade levels. For example, the typical 9th grade student is in the classroom for about 30 h per week, and has 7½ h per week of assigned homework. A 12th grade student typically will spend the same amount of weekly time in the classroom, but will have about 10 h per week of homework. In contrast, when students reach college, they will spend only approximately 15 h per week in the classroom, but are expected to spend 30 or more h per week engaged in studying and homework outside of the classroom. While cultural differences may exist in the amount of homework assigned in different countries (e.g., Chen & Stevenson, 1989), the trend of more homework assigned with increasing grade levels has been empirically supported (see Cooper, Robinson, & Patall, 2006; Cooper & Valentine, 2001).

The increased prevalence of cell phones, other communication technologies, and portable audio devices in contemporary college student populations (see Jacobsen & Forste, 2011) has created the potential for significant attentional conflicts when students complete schoolwork outside of the classroom. One major source of conflict stems from a desire to engage in non-schoolwork activities. A second major source of conflict results from a lack of intrinsic interest in homework activities, and a desire to do anything other than study (Leone & Richards, 1989). In combination, these conflicts likely exacerbate the appeal of using technological devices in the study environment, as these sources of distraction present an easy outlet for the alleviation of boredom during homework completion. Distractions and media multitasking are important issues to study in college student populations, as these students experience little parental or instructor oversight of their study habits. These issues are also particularly salient for members of the current generation of college students, who have been dubbed the "Multitasking Generation" (Wallis, 2006) due to the ubiquity with which they incorporate technology into their daily lives.

1.1. Quantifying college student media multitasking

Despite the widespread recognition of the pervasiveness of technology in contemporary college student life, investigators have yet to objectively explore the frequency and duration with which students multitask with media in their homework environment. Instead,

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researchers have placed primary emphasis on observing or experimentally manipulating multitasking behaviors in classroom environments (e.g., Hembrooke & Gay, 2003; Kraushaar & Novak, 2010; Sana, Weston, & Cepeda, 2013). Those studies which have featured explorations of media multitasking outside of the classroom have relied almost exclusively on self-report data (e.g., Jacobsen & Forste, 2011); despite a lack of evidence that students can or are willing to accurately report multitasking behaviors. In a seven day experience sampling study of student internet use, Moreno et al. (2012) found that the correlation between students' estimated hours per day using the internet and the summation of several within-day concurrent internet-use reports was only $r = .31$, suggesting that students have a limited ability or willingness to accurately estimate their media use. Due to these limitations, there is a strong need for research that objectively quantifies media multitasking in college students completing schoolwork outside of the classroom.

An overreliance on self-report measures in media multitasking studies has also created a dearth of knowledge regarding alternative methodological approaches to examine student multitasking. A variety of observational technologies, such as surveillance systems, head-mounted video cameras, and eyetracking devices, have the potential to be useful tools to explore media multitasking. However, research on these observational technologies has not yet been extended to the homework environment. While such technologies may allow for a more accurate assessment of rates of student multitasking, it is also possible that these more intrusive observational technologies alter student behavior by engendering participant reactivity effects (see Whitley, 2002). Accordingly, it is necessary to analyze both the degree to which alternative observational technologies allow for the quantification of multitasking behaviors and whether these technologies are differentially associated with participant reactivity effects.

1.2. Exploring why college students media multitask

In addition to placing primary emphasis on subjective reports of media multitasking, investigators have generally focused on *how* students multitask with media and *who* is likely to engage in media multitasking, rather than *why* students do or do not engage in these behaviors (see, for example, Foehr, 2006). As investigators have linked media multitasking to impaired academic task performance (e.g., Fox, Rosen, & Crawford, 2009), there is a paradox as to why students would choose to multitask with media during homework completion (see Wang & Tchernev, 2012). Wang and Tchernev (2012) have recently provided evidence to suggest that, although perceived cognitive needs usually drive the initiation of multitasking behaviors, multitasking with media primarily satisfies emotional needs. Despite this recognition, there have been no studies to link objective observations of multitasking behaviors during homework completion to mood or task motivation in college student samples.

The first step in exploring the relationship of mood and task motivation to multitasking during homework completion is to establish whether these processes change over the course of the homework period. Mental work refers to activities accomplished against resistance (Dodge, 1913). All else being equal, sustained periods of mental work are theorized to drain cognitive and attentional resources (Hockey, 1997; Kahneman, 1973). In turn, the depletion of cognitive and attentional resources has been shown to have implications for mood and motivational processes (see Hockey, 2011). Although empirical researchers have observed subjective mood decrements during periods of sustained academic task performance (e.g., Ackerman & Kanfer, 2009), these findings have not yet been generalized to the homework environment. Based on predictions derived from attentional and cognitive resource theories, we predict that decrements in mood and motivation will accompany sustained periods of homework completion.

Hypothesis 1. Mood and motivation will be impaired over sustained periods of homework completion.

While resource-based perspectives imply that engagement in homework tasks will impair mood and task motivation, they do not directly address which mood and motivational processes are related to multitasking behaviors. In the following sections, we review three sets of mood and motivational variables which are likely to be associated with multitasking behaviors during homework completion. Throughout these sections, we provide specific hypotheses regarding the relationships of these mood and motivational variables to multitasking.

1.2.1. Negative and positive affect

Negative and positive affect (NA and PA) respectively refer to the experience of negative and positive mood states (Watson, Clark, & Tellegen, 1988). Theorists have argued that affective experiences have important implications for the allocation of cognitive resources between on-task thoughts and off-task distractions (Beal, Weiss, Barros, & MacDermid, 2005). However, there is evidence to suggest that negative and positive affective experiences are differentially related to this resource allocation process. NA has been consistently linked to engagement in ruminative thought (see Thomsen, 2006 for a review), which has been proposed as a factor in the allocation of cognitive resources to off-task distractions (Beal et al., 2005). In contrast, PA has been theorized to broaden attentional and cognitive resources (Carver, 2003; Fredrickson, 2001), and positive mood states have been associated with more careful processing of goal-relevant (i.e., on-task) information (see Aspinwall, 1998). Based on theories linking affective experiences to cognitive resource allocation and past empirical findings regarding the effects of NA and PA on cognitive resources and attention, we anticipate NA to be linked to more frequent and longer duration multitasking behaviors, while we expect PA to be associated with less frequent and shorter duration multitasking behaviors.

Hypothesis 2. NA and multitasking behaviors will be positively correlated.

Hypothesis 3. PA and multitasking behaviors will be negatively correlated.

1.2.2. Subjective fatigue

Subjective fatigue refers to feelings of tiredness or lack of energy that are not related exclusively to exertion (see Brown & Schutte, 2006). As homework tasks are identified by several characteristics commonly associated with fatigue (see Ackerman, Calderwood, & Conklin, 2012 for a review), sustained periods of homework activity are likely to correspond to increasing levels of fatigue over time. As it relates to off-task distractions, Davis (1946) was one of the first researchers to identify that some individuals divert attention away from primary tasks under conditions of fatigue. While not studied in relation to media multitasking specifically, researchers have generally supported this observation, finding that the ability to regulate goal-directed perceptual and motor processes is compromised under fatiguing conditions (e.g., van der