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Media multitasking and well-being of university students

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ABSTRACT

This study examines the impact of media multitasking behaviors on university students' social and psychological well-being (indicated by social success, normalcy, and self-control measures). To address inconsistent findings in recent literature, we characterized media multitasking behaviors by motivations, characteristics, and contexts. In particular, we examined the motivation of the primary task and the synchronicity of the task when social interactions were involved. Synchronous social interactions were found to be significantly and positively associated with social success, normalcy, and self-control. However, as predicted, media multitasking during synchronous social interactions was associated with lower social success. Further, although increased media multitasking during cognitive activities was linked with decreased self-control, media multitasking during entertainment activities was correlated with increased social success, normalcy, and self-control.

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1. Introduction

Media saturation and convergent technologies have made media multitasking a way of life for many. In the U.S., a majority of teenagers multitask “most” or “some” of the time when listening to music (73% of respondents), watching TV (68%), using a computer (66%), and reading (53%; Rideout, Foehr, & Roberts, 2010). In the UK, on average, 16- to 24-year-olds use media for 9.5 h a day, of which 52% involves media multitasking (Ofcom & GfK, 2010). Given its prevalence, media multitasking has drawn considerable interest from researchers.

Existing research on media multitasking has focused primarily on its increasing popularity and detrimental effects on cognitive performance and functions, but recently, its relationship with social and psychological well-being has gained attention (e.g., Pea et al., 2012; Shih, 2013). Potential negative consequences of media multitasking on well-being have been documented. For example, research has found that among children, it negatively correlates with the feeling of normalcy and capabilities to develop intimate relationship with friends (Pea et al., 2012), and it has been associated with the symptoms of depression and social anxiety in adults (Becker, Alzahabi, & Hopwood, 2012). Findings, however, have been

inconsistent. For example, Shih (2013) found no significant correlation between media multitasking and a range of psychosocial well-being factors, including emotional positivity, sociability, and impulsivity. In other studies, even positive effects of media multitasking on well-being have been suggested. For example, interacting with family members while viewing television enhanced children's prosocial behavior (St. Peters, Huston, & Wright, 1989), and media multitasking was positively correlated with university students' emotional satisfaction, albeit at the cost of cognitive performance (Wang & Tchernev, 2012).

Then, is media multitasking harmful, harmless, or beneficial to social and psychological well-being? Before addressing this question, we propose to further specify the concept of “media multitasking”; we suspect that one reason for inconsistent findings in the literature is the definition of “media multitasking”. In recent literature, media multitasking refers to the simultaneous pursuit of two or more relatively independent tasks, with at least one of the tasks involving media (e.g., Jeong & Fishbein, 2007; Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013). This broad and practical definition is invoked in everyday conversations, news coverage, and research. Its breadth, however, makes comparing findings across studies a challenge because it encompasses a plethora of diverse behaviors. This may obscure critical differences in contexts and characteristics of media multitasking behaviors in well-being research.

For example, both listening to music while studying and listening to music while talking face-to-face with people are

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considered “media multitasking”, although these two behaviors manifest distinct intentions. On the one hand, individuals who listen to music while studying do so to make studying fun without too much distraction, and it is one of the most popular multitasking behaviors among university students (David, Kim, Brickman, Ran, & Curtis, 2014). On the other hand, listening to music during a face-to-face conversation is not common and is likely to be viewed as discourteous; it may suggest avoidance of social interaction. Hence, it is possible that frequent multitasking during face-to-face communication could be negatively associated with social relationships and well-being in the long run, but we may not easily draw the same conclusion for multitasking during study. However, existing research on the relationship between media multitasking and well-being relies on the popular media multitasking index¹ (Ophir, Nass, & Wagner, 2009) to gauge media multitasking behavior. This index, although valuable for assessing general media multitasking tendencies, aggregates a variety of media multitasking activities, making it impossible to distinguish the impacts of these different activities on well-being.

Two important criteria to differentiate media multitasking behaviors are motivations and resources demands. There is growing evidence that different goals motivate different media multitasking behaviors, which have different impacts on gratifying these goals (Hwang, Kim, & Jeong, 2014; Wang & Tchernev, 2012; Zhang & Zhang, 2012). Furthermore, based on the psychological literature, eleven cognitive dimensions of media multitasking behaviors (e.g., relevance of the tasks, modalities of the tasks, behavioral responses required by the tasks) have been identified as making some media multitasking behaviors more resource intensive than others and, thus, impacting behavioral outcomes and choices differently (Wang, Irwin, Cooper, & Srivastava, 2015). Based on Wang et al.'s cognitive dimensional framework, it is easy to see why, despite the overwhelming number of studies showing negative consequences of media multitasking on task performance, some studies have found an increase in task performance, such as when the tasks are highly relevant and executed through non-competing modality channels (e.g., Moreno & Mayer, 1999; Wang et al., 2015). Following these ideas, it seems reasonable to predict that distinct motivations and cognitive characteristics of media multitasking behaviors can impact social and psychological well-being in different ways, leading to divergent findings on their relationships. This is the general issue explored in the current study.

In this study, we compared media multitasking behaviors motivated by different goals and with different cognitive characteristics. Specifically, based on recent portrayals of the communication activities of university students (David et al., 2014; Wang & Tchernev, 2012), we categorize media multitasking behaviors by their primary task motivation (social, cognitive, and entertainment); we also consider synchronicity, an important characteristic

of media multitasking behaviors that determines resource demands (Walther, 1996; Wang et al., 2015).

2. Media multitasking among university students and its motivations

Media multitasking has become increasingly popular thanks to the versatility and accessibility of computers, smartphones, and tablets, which allow for the seamless integration of work, play, and social interaction (e.g., Carrier, Cheever, Rosen, Benitez, & Chang, 2009; David et al., 2014; Rosen, Mark Carrier, & Cheever, 2013; Srivastava, 2013). A recent investigation in the U.S. (David et al., 2014) revealed the major communication and media activities of undergraduate students on a typical day based upon self-report of 992 respondents. In this study, estimates of time spent on communication and media reached 39 h a day. Such an overestimation can be—at least partially—attributed to multitasking.

Media multitasking has been examined mainly for its negative impact on cognitive performance and functions, such as academic performance (e.g., Junco, 2012; Junco & Cotten, 2012; Wood et al., 2012). However, entertainment and social functions of media use and media multitasking are also important (Hwang et al., 2014; Wang & Tchernev, 2012). In a longitudinal experience-sampling study on university students' daily activities over a month, Wang and Tchernev (2012) found that students sacrificed performance on cognitive tasks for emotional and entertainment gains by engaging in media multitasking activities. More specifically, despite students' stated cognitive motivation, emotional and entertainment needs were gratified by media multitasking although they were not consciously sought after.

The diverse motivations and functions of media multitasking behaviors point to the importance of the context in which media multitasking occurs. When listening to music for relaxation or entertainment, responding to a text message may have no consequences. However, if the motivation for listening to music were to learn the lyrics of the songs (i.e., cognitive motivation), texting during listening would interfere with learning. In this example, the impact of the same media multitasking behavior changes when the motivation of the primary task changes.

In line with previous studies on university students' time spent on communication and media activities (Calderwood, Ackerman, & Conklin, 2014; David et al., 2014; Wang & Tchernev, 2012), this study identifies three communication contexts of media multitasking: (1) social-interaction activities driven by social needs, which are comprised of face-to-face communication, phone and video chat, texting, and social networking; (2) media-based entertainment activities driven by relaxation, emotional, and entertainment needs, including listening to music, watching TV or videos online, and playing video games; and (3) cognitive activities motivated by cognitive needs, mainly reading and studying (in our sample of university students).

3. Resource characteristics of media multitasking behaviors

Another important way to specify media multitasking behaviors is to take into consideration the resource demands of the tasks. Based on psychological theories and findings on limited resources and resource allocation (Lang, 2000; Salvucci & Taatgen, 2008; Wickens, 2002), media multitasking has been conceptualized as a multidimensional behavior, with the dimensions of tasks requiring and attracting different types and amounts of resources (Wang et al., 2015). For example, multitasking activities with lower levels of modality sharing and higher levels of control over information flows (e.g., listening to music from a playlist while doing homework) are less demanding than those that compete for the

¹ The media multitasking index was developed by Ophir et al. (2009) and adapted by Pea et al. (2012) to define the level of media multitasking. This measure includes 8 different media forms: (1) watching video content (TV, YouTube, movies, etc.); (2) playing video games; (3) listening to music; (4) reading or doing homework; (5) e-mailing or sending messages/posting on SNS (not including Facebook chat); (6) texting or instant messaging (including Facebook chat); (7) talking on the phone or video chatting; and (8) participating in face-to-face conversations. For each media-use category, respondents reported the total number of hours per week they spend engaging in it. The question was followed by a multiple-choice scale with options that were assigned numerical values for analysis: *never* (0), *less than 1 h* (.5), *about 1 to 2 h* (1.5), *about 2 to 3 h* (2.5), *about 3 to 4 h* (3.5), or *more than 4 h* (4.5). The media multitasking index is the weighted sum of the number of additional media an individual is using when involved in these eight communication activities. Therefore, the index encompasses a wide range of media multitasking behavior.

same modality resources and allow for less control (e.g., watching a live television program while doing homework).

In the current study, we focused on two aspects of media multitasking behaviors identified by Wang et al. (2015): task switching and time pressure. Task switching here refers to the extent of control people have over switching between tasks—that is, whether the multitasking context allows the user to change when and where mental resources are allocated. For example, multitasking behaviors involving instant messaging grant users more control over when to attend to concurrent tasks than do those involving phone conversations, as individuals' interactions over the phone tend to be dictated by the social expectation to respond in a timely fashion to one's partner (Wang, David, et al., 2012). Further, whether one or more tasks require quick responses adds more complexity to the dynamics of media multitasking. For example, multitasking involving face-to-face conversation imposes greater time pressure than that involving interaction on social networking sites (SNS).

The characteristics of task switching and time pressure closely relate to an important feature of media—synchronicity, which has been highlighted in the literature on interactive media technology. Synchronicity refers to media capabilities through which individuals can transmit and process information and communicate in real time (Dennis, Fuller, & Valacich, 2008; Walther, 1996). Some communication activities are synchronous, such as face-to-face communication and phone calls/video chat, whereas texting and SNS activities are typically asynchronous. As underlined by the hyper-personal model in computer-mediated communication (Walther, 1996), synchronous social interaction requires both temporal commitment and simultaneous attention. Although asynchronous media activities (involving, e.g., texting and SNS) solve temporal conflicts by allowing individuals to attend to social interactions at their own convenience, synchronous media activities (involving face-to-face interaction, video conferencing, and telephone calls) can lead to higher satisfaction and perceived effectiveness of communication (Nowak, Watt, & Walther, 2009). As discussed, in the context of media multitasking, synchronous communication means less control over task switching and greater time pressure. This indicates higher demands on cognitive resources and, thus, a greater likelihood of suffering from limited yet divided attention (Wang, David, et al., 2012).

Based on the above discussion, social interaction can be divided into synchronous (including face-to-face, and phone calls/video chat) and asynchronous (including texting and using SNS) categories. Taken together, we examine communication activities in four contexts (driven by cognitive motivation, driven by entertainment motivation, driven by social motivation and synchronous, and driven by social motivation and asynchronous) in the current study, as summarized in Table 1. We hypothesize that in general, media multitasking in the four different contexts should have distinctive effects on social and psychological well-being—specifically, as indicated by measures of social success, normalcy, and self-control (*Hypothesis 1*). These three well-being variables have been examined in the literature on media multitasking, as reviewed next. Based on the following review, we also propose more specific hypotheses below relating each of the well-being variables to the media multitasking contexts.

4. Social success

Social success is a crucial developmental task during adolescence and emerging adulthood (Erikson, 1968; Pea et al., 2012). It is conceptualized as having friends and being socially skilled, including being able to develop and maintain close and meaningful friendships (Pea et al., 2012). Research has found that those who

report an increase in social support over the time of emerging adulthood show improved psychological well-being (Galambos, Barker, & Krahn, 2006), whereas perceived lack of social support is related to depression and loneliness (Jackson, Soderlind, & Weiss, 2000).

The social success of university students is largely connected to their social-interactions, which are driven by social needs and carried out through both face-to-face and technology-mediated communication (Ellison, Steinfield, & Lampe, 2007; Wang, Tchernev, & Solloway, 2012). However, the context of social interaction has been fundamentally altered by multitasking facilitated by mobile technologies such as smartphones and tablets. Multitasking diverts attention away from one's present social interactions and orients one's thoughts to people, places, and activities outside the immediate spatial context (Misra, Cheng, Genevie, & Yuan, 2014). This split attention invited by media multitasking has the potential to strain social interactions and relationships. In fact, a recent study showed that even the mere presence of mobile phones could diminish the experience of face-to-face conversations (Przybylski & Weinstein, 2013). Through two laboratory experiments, the researchers showed that the presence of a mobile phone placed on a desk next to paired participants but outside of their direct visual field had negative effects on their perceived closeness, connection, and conversation quality, and these effects were most apparent when the participants were discussing personally meaningful topics. In a more naturalistic field study, the mere presence of a mobile phone placed innocuously near participants while they were having a conversation was found to interfere with their perceived closeness and connection and related to the participants' diminished empathetic concern toward each other (Misra et al., 2014). It is worth noting, though, that in both studies, the primary tasks were real-time conversations.

As discussed, it is important to consider the synchronicity of social interaction when evaluating the effects of media multitasking. Synchronous social interaction, such as real-time conversations in person or over phone or video technologies, demand more cognitive resources for producing timely responses (Wang, David, et al., 2012; Wang et al., 2015). Thus it is more likely to be negatively affected by multitasking than asynchronous social interaction, such as texting and SNS communication, which does not require real-time responses. As Wang, David, et al. (2012) have argued based upon resources theories and, in particular, the threaded cognition theory of multitasking, "Except for some critical activities, such as driving, the immediate loss in performance from multitasking or task-switching may be gained somewhere down the line" (p. 974). Asynchronous social interaction is unlikely to be among those "critical activities" in which one has no control over task switches or is under high time pressure for responding. Instead, media users can actively control task switches and, hopefully, allocate limited resources along the timeline in an optimal or at least sensible way to achieve multiple goals through multitasking.

Furthermore, the more resource demanding media multitasking behaviors are, the less frequently they should be selected in everyday life because of "the law of less work" to conserve resources (Hull, 1943; Kool, McGuire, Rosen, & Botvinick, 2010; Wang et al., 2015). Likely because of this, multitasking during synchronous social interactions is perceived as less appropriate than multitasking during asynchronous social interactions. Therefore, we expect media multitasking during synchronous social interaction to cause unpleasant social experiences and thus, in the long run, decrease perceived social success. We predict that social success is negatively correlated with media multitasking during synchronous social interaction, but not during asynchronous social interaction (*Hypothesis 2*).

5. The feeling of normalcy

Another indicator of social well-being is *normalcy*, the feeling of being understood and accepted by peers (Reis & Shaver, 1988). Peer acceptance is considered to promote the development of meaningful friendships, whereas peer rejection results in challenges in establishing them (Nangle, Erdley, Newman, Mason, & Carpenter, 2003) and leads to troubling issues in later personality development (Ladd, 2006). Much research has found that by late adolescence, peers are typically the strongest influence on personal behavior, and university students appear to be no exception in trying to become in-group members among their peers (e.g., Perkins, 2002). Given that university students are away from parents and lacking frequent contact with siblings and members of other reference groups, such as religious communities and full-time jobs, peer acceptance and the sense of normalcy are particularly crucial for their social well-being.

Similar to social success, the feeling of normalcy is gradually established through interactions with peers. Whereas social success is cultivated through interpersonal conversations, closeness, and connection, the feeling of normalcy is closely related to social and peer norms and is shaped by observing group behaviors, adopting group attitudes, and behaving in accordance with peer expectations (Festinger, 1954; Reno, Cialdini, & Kallgren, 1993; Rhodes & Ewoldsen, 2009). There are two types of norms: descriptive norms, which specify “what most people do in a particular situation”, and injunctive norms, which specify “what is typically approved in society” (Reno et al., 1993, p.104). Given the popularity and prevalence of media multitasking behavior among university students (David et al., 2014), media multitasking—even during face-to-face communication and in classroom lectures—has become a new “norm” among many university students under certain situations (Gabriel, Campbell, Weibe, MacDonald, & McAuley, 2012). For example, surveys and interviews of students and faculty at a Canadian university showed that students in general held a strong belief in their media multitasking capabilities (Gabriel et al., 2012). One faculty member interviewed in the study reported that in lectures, students “come with their laptops, they’re doing their Facebook while they’re taking the odd note while they’re checking e-mail, and so their attention span is all over the place” (pp. 9–10). Similarly, during face-to-face conversions, young people are getting used to checking their text messages, Facebook pages, or Twitter feeds (Turkle, 2012).

However, as discussed earlier, depending on their primary motivation and characteristics, the four contexts of media multitasking behaviors may impact normalcy differently—at least in the current social environment. For communication activities that are primarily motivated by social interaction or cognition, the trend of media multitasking becoming expected and normative probably occurs chiefly at the level of descriptive norms (i.e., “Many people do it”) but not at the level of injunctive norms (i.e., “This is an approved behavior”), as suggested by the disapproving tone of the researchers (e.g., Gabriel et al., 2012). However, for media multitasking that is primarily motivated by entertainment, this normative perception of media multitasking may have been constructed at both the descriptive and injunctive norm levels. Engaging in media multitasking is expected and approved, as media often can facilitate entertainment and enjoyment (e.g., chatting on mobile devices about a TV show while watching the show; Giglietto & Selva, 2014; Nielsen, 2013). Therefore, although the feeling of normalcy is closely related to social success, we expect that media multitasking behavior should have different effects on normalcy than on social success because of the emerging social norms of media multitasking perceived by university students, but the effects may differ depending on contexts. Specifically, we posit that

media multitasking in the four communication contexts should not significantly decrease the feeling of normalcy, and that normalcy may be positively correlated with multitasking in the context of entertainment-driven media use (*Hypothesis 3*).

6. Self-control

Academic growth—a main goal and function of university experience—requires students to sustain attention to learning tasks, which demands self-control. Self-control, often used interchangeably with self-regulation (Baumeister & Alquist, 2009), has been used to predict cognitive learning outcomes in school (e.g., grade point average; see Duckworth & Seligman, 2005; Tangney, Baumeister, & Boone, 2004). Self-control has been defined by Zimmerman (2002) as “the self-directive process through which learners transform their mental abilities into task-related academic skills” (p. 65). Based on the theory of self-regulated learning, self-regulated learners tend to block out distracters in a learning environment (Pintrich & de Groot, 1990) and actively engage in cognitive processing of learning materials (Zimmerman, 2002). If that is the case, then over time, the decreased top-down attentional control associated with frequent media multitasking during situations in which undivided attention is required (e.g., learning tasks) may lead to lower self-regulation (self-control). Research has found that compared to light media multitaskers, heavy media multitaskers are more likely to be distracted by irrelevant stimuli and less likely to sustain their attention on cognitive tasks (Ophir et al., 2009). Furthermore, accumulated evidence shows that media multitasking while studying is associated with shallower processing (Carr, 2010), poor performance in the classroom (Rosen et al., 2013; Wood et al., 2012), and lower grade point average (Junco, 2012), which can collectively hinder success and well-being in life. More important, self-control is associated with psychological well-being directly, as low self-control is associated with a wide range of deviant behaviors, whereas a higher degree of self-control is positively related to better planning and decision-making (Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). For example, in one study, students with low self-control were at greater risk for reporting binge drinking, marijuana use, and prescription-drug misuse (Ford & Blumenstein, 2013).

In light of self-control's important effects on the well-being of university students, we examine whether university students' media multitasking behavior relates to their self-control above and beyond their media and communication activities in general. More specifically, for our sample of university students, we predict that media multitasking during media cognitive activities would be negatively correlated with self-control (*Hypothesis 4*).

7. Method

7.1. Participants

An online survey was conducted between March and May of 2014. Participants were undergraduate and graduate students recruited from 59 universities in Beijing, China. Participants were recruited online to complete an online survey created using Qualtrics software (Qualtrics, 2013). The survey link was distributed online through major SNS used widely by university students in Beijing. As an incentive, students were offered the opportunity to enter a lottery with a chance to win one of 10 cell phone gift cards (a \$17 value).

In total, 375 students completed the survey. They were 18–38 years old ($M = 20.90$, $SD = 2.66$), and 61.9% were female. Most (69.5%) reported that they were single, about one-third (29.1%) reported being in a relationship, and 1.3% were married. Many were

freshmen (40.2%), and the rest were sophomores (19.7%), juniors (17.0%), and seniors (8.4%), or graduate students (14.8%). Almost all reported owning a smartphone (97.3%). On average, participants reported keeping in touch with 7.53 ($SD = 5.62$) family members and 10.89 ($SD = 17.24$) close friends through SNS and having 186.36 ($SD = 258.68$) friends on SNS.

7.2. Measures

7.2.1. Communication activities

Participants were asked how many hours on a typical day they spent on the following activities: (1) watching video content (e.g., TV, online video, and movies); (2) playing video games; (3) listening to music; (4) reading, studying, or doing homework; (5) e-mailing or sending messages/posting on SNS (excluding chatting on SNS); (6) texting or instant messaging; (7) talking on the phone or video chatting; (8) having face-to-face conversations in person. These items were adopted from Wang and Tchernev (2012) and David et al. (2014), and included typical college students' daily communication activities. For each activity, participants reported their daily level of engagement by selecting one of the following options: (numerical values assigned to each option are labeled in parentheses): *never* (0); *less than 1 h* (.5), *about 1 to 2 h* (1.5), *about 2 to 3 h* (2.5), *about 3 to 4 h* (3.5), *about 4 to 5 h* (4.5), or *more than 5 h* (5.5).

Based on the theoretical reasons described earlier, the following four multitasking contexts were considered: (1) *media-based entertainment activities*, including watching video content, listening to music, and playing video games; (2) *media-based cognitive activities*, including reading, studying, and doing homework using media; (3) *asynchronous social interaction*, including e-mailing, most SNS use (excluding real-time chatting on SNS), and texting and instant messaging; and, finally, (4) *synchronous social interaction*, including talking on the phone or video chatting (including real-time chatting on SNS) and having in-person, face-to-face conversations.

7.2.2. Media multitasking tendencies

For each of the eight communication activities listed above, participants were also asked to indicate the percentage of time (1%–100%) they would typically be engaging in another form of communication activity. For example, “While you are having a face-to-face conversation in person, what percentage of the time are you also doing any of the following activities?” The listed activities included all the communication activities described earlier, excluding face-to-face communication. Then, the sum of all the percentages was used as the indicator of multitasking tendency during face-to-face conversations. Finally, we computed multitasking tendency for the four communication activity contexts by taking the average of all activities within a context.

7.2.3. Social success

Social success was measured using an index adopted from Pea et al. (2012). Participants were asked to rate seven statements using 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*)—for example, “I feel like I have a lot of friends”, “People my age understand me”, and “I feel like I have a lot of close friends”. The average of the ratings was used to create the final score for social success. The index was reliable (Cronbach's $\alpha = .89$).

7.2.4. Normalcy

Following Pea et al. (2012), we had participants rate three statements using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). The statements were “Compared to people my age, I feel normal”, “I often feel like I'm not normal compared to people my age” (reverse-coded), and “I often feel rejected by other people my age”. The average of the ratings was used to create the final score for normalcy. The index was reliable (Cronbach's $\alpha = .79$).

7.2.5. Self-control

Following Tangney et al. (2004), we used a 5-point Likert scale to measure self-control. Participants rated 11 statements, such as “I have trouble concentrating”, “I have worked or studied all night at the last minute”, and “Getting up in the morning is hard for me”. The average of the ratings (after reverse-coding some items) was used to indicate self-control. The scale was reliable (Cronbach's $\alpha = .82$).

7.2.6. Demographics

To collect some basic information about the sample, we also had participants report their age, gender, year in university, marriage and relationship status, ownership of a smartphone, and number of family members, close friends, and friends on SNS.

8. Results

The analysis began with a descriptive analysis of the variables. Then, hierarchical regression models were used to examine the effects of multitasking tendencies on well-being.

8.1. Descriptive summary of key variables

As summarized in Table 1, on average, participants spent 4.29 h ($SD = 2.26$) per day on entertainment-driven media activities (gaming, music, and video), 4.05 h ($SD = 2.46$) on asynchronous social interaction (SNS and texting), 3.36 h ($SD = 1.90$) on synchronous social interaction (face-to-face and phone call/video chat), and 2.32 h ($SD = 1.39$) on cognitive media activities (reading, studying, and doing homework).

Table 1

Time spent (in hours) on four categories of communication activities and percentage of time spent multitasking during these activities.

Communication activities	Mean hours spent (SD)
Synchronous social interaction	3.36 (1.90)
Asynchronous social interaction	4.05 (2.46)
Entertainment-driven media activities	4.29 (2.26)
Cognitive media activities	2.32 (1.39)
Multitasking tendencies during communication activities	Mean percentage of hours (SD)
MT during syn social interaction	62 (83)
MT during asyn social interaction	116 (89)
MT during entertainment media activities	110 (77)
MT during cognitive media activities	109 (89)

*Note: The percentage can be greater than 100% because of simultaneous engagement of more than two tasks at a time.

Multitasking tendencies during these activities also are summarized in Table 1. It is interesting to note that rates of multitasking in three of the four contexts were greater than 100%. This may be explained by the fact that sometimes more than two communication tasks were added to a primary communication task. On average, participants were most likely to multitask during asynchronous social interaction ($M = 1.16$ or 116%, $SD = .89$), followed entertainment-driven media activities ($M = 110\%$, $SD = .77$) and cognitive media use ($M = 109\%$, $SD = .89$). Consistent with previous findings (Wang et al., 2015), multitasking was least common during synchronous social interaction ($M = 62\%$, $SD = .83$).

8.2. Hierarchical regression analysis

Hierarchical regression models were used to examine the effects of media multitasking tendencies on the three well-being indicators (social success, normalcy, and self-control). The assumptions of multicollinearity based on the values for tolerance and the variation inflation factor were examined, which were above .10 and below 10, respectively, for all models. Normal probability plots of the regression standardized residual and the scatterplot were also checked to ensure that the assumptions of linearity, normality, independence of residuals, and homoscedasticity were satisfied.

For each of the three well-being indicators, in Step 1, we entered the four contexts of communication as predictors. Gender and age were controlled as well. In Step 2, multitasking tendencies in the four communication contexts were entered. In Step 3, two-way interactions between each communication context and its corresponding multitasking tendency were entered.

Two-way interactions from Step 3 did not significantly contribute to the changed R -squared value for any of the well-being indicators and were subsequently dropped. However, multitasking variables added in Step 2 significantly increased the R -squared value compared to Step 1 models (see Table 2). Hence, the final selected models were the Step 2 models for all three well-being variables, which are summarized in Table 2. As predicted in Hypothesis 1, media multitasking during the four communication contexts (i.e., variables added in Step 2) influenced social and psychological well-being variables in different ways—there were positive, negative, and null effects. Hence, Hypothesis 1 was supported.

8.2.1. Social success

The more complex model with media multitasking variables added in Step 2 significantly increased the explained variance

when compared to the model that included only communication activities, age, and gender ($\Delta R^2 = .035$, $p < .01$). This suggests that media multitasking tendencies during communication are positively associated with social success. The model predicting social success was statistically significant, $F(10, 364) = 3.69$, $p < .001$; the R -squared value was .092, meaning the model explained 9.2% of the variance in social success, whereas 3.5% was contributed by media multitasking tendencies. As shown in Table 2, synchronous social-interaction activities significantly increased perceived social success ($\beta = .25$). However, media multitasking tendency during synchronous social interaction significantly decreased social success. When the tendency increased by one unit (e.g., 1% of time), perceived social success decreased by .22 points (on the 1–5 point scale). However, and also as predicted, the media multitasking tendency during asynchronous social interaction was not significantly related to social success. Together, these findings support our Hypothesis 2—that multitasking during synchronous, but not asynchronous, social interaction would decrease perceived social success. In addition, it is interesting to note that the media multitasking tendency during entertainment-driven media activity significantly increased social success ($\beta = .21$).

8.2.2. Normalcy

The more complex model with media multitasking variables significantly increased the explained variance in normalcy ($\Delta R^2 = .043$, $p < .005$). The overall model predicting normalcy was statistically significant, $F(10, 364) = 2.53$, $p < .01$; the R -squared value was .065, meaning the model explained 6.5% of the variance of normalcy, with 4.3% contributed by media multitasking variables (see Table 2). On the one hand, as with social success, synchronous social interaction activities ($\beta = .17$) significantly increased normalcy. On the other hand, as predicted by Hypothesis 3 and in contrast to our finding regarding social success, none of the four media multitasking variables was negatively correlated with normalcy. Instead, the media multitasking tendency during entertainment-driven media activities positively predicted normalcy ($\beta = .19$). The 95% confidence intervals for estimated regression coefficients were $[-.302, .041]$ for media multitasking during synchronous social interaction, $[-.275, .146]$ for media multitasking during asynchronous social interaction, and $[-.349, .004]$ for media multitasking during cognitive media activities. All CIs were tightly around 0, supporting the null-effect predictions of media multitasking in these contexts.

Table 2
Summary of regression results for predicting well-being indicators.

	Social success		Normalcy		Self-control	
	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β
Step 1						
Intercept	2.948 (.349)		3.462 (.400)		1.797 (.298)	
Synchronous social interaction	.100 (.023)	.251***	.079 (.027)	.174**	.064 (.020)	.180**
Asynchronous social interaction	-.037 (.019)	-.119	-.009 (.022)	-.026	-.039 (.017)	-.142*
Entertainment media activities	.002 (.019)	.006	-.028 (.022)	-.074	-.011 (.016)	-.037
Cognitive media activities	.018 (.028)	.032	-.024 (.032)	-.038	.110 (.024)	.227***
Age	.003 (.015)	.012	.019 (.017)	.060	.046 (.013)	.180***
Gender	-.136 (.084)	-.087	.084 (.097)	.047	-.065 (.072)	-.047
Step 2						
MT during syn social interaction	-.224 (.076)	-.245**	-.131 (.087)	-.127	.030 (.065)	.038
MT during asyn social interaction	.086 (.093)	.101	-.064 (.107)	-.067	.016 (.080)	.021
MT during entertainment media activities	.210 (.084)	.213*	.212 (.096)	.190*	.210 (.071)	.241**
MT during cognitive media activities	-.023 (.078)	-.026	-.172 (.090)	-.178	-.182 (.067)	-.240**
R^2 for step 1	.058**	.022	.120***			
ΔR^2 for step 2	.035**	.043**	.030*			

* $p < .05$, ** $p < .01$, *** $p < .001$.

8.2.3. Self-control

As for the other two well-being indicators, the more complex model with media multitasking variables significantly increased the explained variance in self-control ($\Delta R^2 = .030$, $p < .01$). The overall model predicting self-control was statistically significant, $F(10, 364) = 6.41$, $p < .001$; the R -squared value was .150, meaning the model explained 15% of the total variance of self-control, and 3% was contributed by media multitasking (see Table 2). As with the other two well-being variables, synchronous social interaction activities were significantly and positively related to self-control ($\beta = .18$). However, asynchronous social interaction ($\beta = -.14$) was significantly and negatively related to self-control. It is probably not surprising that cognitive activities, such as study and reading, were positively related to self-control ($\beta = .23$).

The coefficients estimated for media multitasking variables helped confirm Hypothesis 4: The media multitasking tendency during cognitive media activities was significantly and negatively related to self-control ($\beta = -.24$). However, as with social success and normalcy, the media multitasking tendency during entertainment-driven media activities was significantly and positively related to self-control ($\beta = .24$).

9. Discussion

The primary goal of this study was to explore different impacts of media multitasking on social and psychological well-being in four media multitasking contexts. Based on motivational research on media use and media multitasking behaviors (David et al., 2014; Hwang et al., 2014; Wang & Tchernev, 2012; Zhang & Zhang, 2012), we examined three types of motivations: social, cognitive, and entertainment. We also considered synchronous and asynchronous communication, an important distinction that has been identified in the literature (Walther, 1996; Wang et al., 2015). As predicted, for different contexts, media multitasking influenced the three indicators of social and psychological well-being in different ways—yielding positive, negative, and null effects.

The variance explained ranged from relatively small to moderate in the current sample, with the models explaining 9.2%, 6.5%, and 15% of social success, normalcy, and self-control, respectively. Additional variance accounted for by media multitasking variables entered in Step 2 was 3.5% in social success, 4.3% in normalcy, and 3% in self-control. Considering that only a simple set of key variables relevant to communication activities and media multitasking tendencies were included, a small effect is to be expected. Further, other variables that contribute to well-being, such as physical health, social economic status, and family and social support (Penedo & Dahn, 2005; Pinguart & Sørensen, 2000), were not considered in this study. In addition, as dynamic systems theories indicate, “small” media effects may accumulate over time and through the life span, lead to a greater impact on individuals (e.g., Wang, Lang, & Busemeyer, 2011; Wang, Tchernev, & Solloway, 2012; Ward, 2002;). This warrants even more attention, considering the accelerating media multitasking trend among younger people (Carrier et al., 2009).

9.1. Media multitasking in different communication contexts

A large body of research has established that media multitasking during cognitive activities, such as reading and studying, produces negative consequences. Prior research has revealed that media multitasking during cognitive activities is associated with decreased comprehension of and memory for lectures (Rosen et al., 2013; Wood et al., 2012), shallow processing (Carr, 2010), failure to satisfy cognitive needs (Wang & Tchernev, 2012), lower grade point average (Junco, 2012), and susceptibility to distractions from

irrelevant information (Ophir et al., 2009). All of these may be related to deficient self-control during required cognitive activities for university students and may further lead to interference with daily life, hindering career success and well-being (David et al., 2014).

Interestingly, however, in a different communication context, media multitasking showed positive effects on well-being. More specifically, our study revealed that media multitasking during entertainment-driven media activities was positively related to indicators of social and psychological well-being—namely, social success, normalcy, and self-control. The beneficial outcomes of multitasking during entertainment-driven media activities have to do with the motivation of the primary task. Generally, people involved in entertainment-driven activities want to have fun and be relaxed, so the goals of such activities are generally less pressing and do not require intense and potentially exhausting concentration. Therefore, competition for cognitive resources might not be acute during entertainment-driven activities, which should free up resources for other activities in a seemingly effortless way. Consequently, the characteristics of multitasking during these activities allow the concurrency of multitasking behaviors without interfering with primary-task performance or leading to feelings of stress. In many entertainment-based situations, multitasking can even increase enjoyment and positive social outcomes, such as providing a shared interactive experience with friends or other fans on social media while watching a common-interest TV show or live sports telecast (e.g., Nielsen, 2013; Shim, Oh, Song, & Lee, 2015).

Media multitasking during social interactions had more complex effects on well-being, depending on the synchronicity of such interactions. On the one hand, during synchronous social interactions (e.g., face-to-face conversations, phone conversations, video chats), the higher the media multitasking tendency, the lower the degree of social success. On the other hand, during asynchronous social interactions (e.g., emailing, texting, online chatting), the tendency of media multitasking made no difference on indicators of well-being. Thus, the synchronicity of social interaction is critical and should be taken into consideration in discussions of the effects of media multitasking.

9.2. The critical role of synchronous social interactions in well-being

The results of this study resonate with previous findings on the importance of synchronous social interactions in building meaningful relationships and maintaining mental health, even as our social relationships now have been shaped by SNS, e-mail, and short text messages (e.g., Misra et al., 2014; Pea et al., 2012). Synchronous social interactions are communication activities that provide greater immediacy of feedback, leading to simultaneous sender-and-receiver exchanges (Walther, 1996), including face-to-face communication and phone calls/video chats. Synchronous social interactions lead to higher satisfaction of team relations (Nowak et al., 2009) and are associated with a wide range of positive social and psychological feelings (Pea et al., 2012).

Given the crucial role of synchronous social interactions, it is even more important to note that media multitasking during such activities has a deleterious impact on well-being. Today, the context of social interactions has been fundamentally altered by media multitasking facilitated by mobile devices. We often face situations in which multiple goals and needs are combined and a “natural” solution is to juggle multiple tasks. Mobile technologies have facilitated and encouraged divided attention by providing cues for other tasks (e.g., alerts for incoming e-mails and text messages) and providing multitasking capabilities (e.g., apps with different functions on smartphones) that enable the distribution of attention to

people and matters outside the immediate spatial and temporal contexts (Misra et al., 2014). As discussed, media multitasking during synchronous social interaction may gradually become more and more expected and normative among university students at the descriptive-norm level, though it is still viewed as inappropriate by many (e.g., Bauerlein, 2008). Indeed, experimental research has suggested that this split attention due to multitasking has ramifications in the form of restraining the synchronous social interactions in which people expect immediate responses and focused conversation, and, further, on their interpersonal relationships generally (Wang, David, et al., 2012). In comparison, multitasking during asynchronous social interaction was not significantly related to any indicators of well-being. Asynchronous social interaction, compared with synchronous interaction, allows communicators to create a message at one time and recipients to obtain it later, without interfering with conversational flow (Walther, 1996). This interaction system does not impose a pressing time constraint, which makes extra cognitive resources available for multitasking activities (Wang, David, et al., 2012). These findings can help guide multitasking training and design for workplaces. For example, when a job requires significant task switches between communication and information navigation (e.g., customer services), it is advisable to use an asynchronous medium (e.g., texting or online chatting) instead of a synchronous one (e.g., video chat).

9.3. Limitations and implications

The study is among the first to differentiate the impacts of media multitasking on social and psychological well-being by specifying the motivations and cognitive characteristics of media multitasking behaviors. As predicted, indeed the impacts vary depending on the contexts and nature of the media multitasking behavior. However, given that this study was based on survey methods, these findings are correlational, not causal. We cannot determine whether different types of media multitasking behaviors affected or resulted from social and psychological well-being. For example, media multitasking during synchronous communication could disrupt attention and conversation quality, thereby leading to decreased social success in the long run. Alternatively, it is possible that people who are socially anxious use media multitasking as a distraction tactic to avoid social interactions.

In fact, such a relationship between individual traits and media multitasking behaviors is likely to have reciprocal causality in the long run. Individual differences in mental states and traits can determine media multitasking behaviors, which in turn can further reinforce or change the individual states and traits (Slater, 2007; Wang, 2014; Wang & Tchernev, 2012). Future research should try to replicate these results and also formally test the causal relationship between media multitasking and well-being through experiments and longitudinal studies. As a first attempt, the current study has provided evidence for the plausibility of this causality.

References

- Bauerlein, M. (2008). *The dumbest generation: How the digital age stupefies young Americans and jeopardizes our future*. New York, NY: Jeremy P. Tarcher/Penguin Group.
- Baumeister, R. F., & Alquist, J. L. (2009). Is there a downside to good self-control? *Self and Identity*, 8(2–3), 115–130. <http://dx.doi.org/10.1080/15298860802501474>.
- Becker, M. W., Alzahabi, R., & Hopwood, C. J. (2012). Media multitasking is associated with symptoms of depression and social anxiety. *Cyberpsychology, Behavior, and Social Networking*, 16(2), 132–135. <http://dx.doi.org/10.1089/cyber.2012.0291>.
- Calderwood, C., Ackerman, P. L., & Conklin, E. M. (2014). What else do college students “do” while studying? an investigation of multitasking. *Computers & Education*, 75, 19–29. <http://dx.doi.org/10.1016/j.compedu.2014.02.004>.
- Carr, N. (2010). *The shallows: What the internet is doing to our brains*. New York: W.W. Norton & Company, Inc.
- Carrier, L. M., Cheever, N. A., Rosen, L. D., Benitez, S., & Chang, J. (2009). Multitasking across generations: multitasking choices and difficulty ratings in three generations of Americans. *Computers in Human Behavior*, 25(2), 483–489. <http://dx.doi.org/10.1016/j.chb.2008.10.012>.
- David, P., Kim, J.-H., Brickman, J. S., Ran, W., & Curtis, C. M. (2014). *Mobile phone distraction while studying*. New Media & Society. <http://dx.doi.org/10.1177/1461444814531692>. Advance online publication.
- Dennis, A. R., Fuller, R. M., & Valacich, J. S. (2008). Media, tasks, and communication processes: a theory of media synchronicity. *MIS Quarterly*, 32(3), 575–600.
- Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, 16(12), 939–944. <http://dx.doi.org/10.1111/j.1467-9280.2005.01641.x>.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook “friends”: social capital and college students’ use of online social network sites. *Journal of Computer-Mediated Communication*, 12(4), 1143–1168. <http://dx.doi.org/10.1111/j.1083-6101.2007.00367.x>.
- Erikson, E. (1968). *Identity: Youth and crisis*. New York: Norton.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7(2), 117–140.
- Ford, J. A., & Blumenstein, L. (2013). Self-control and substance use among college students. *Journal of Drug Issues*, 43, 56–68. <http://dx.doi.org/10.1177/0022042612462216>.
- Gabriel, M. A., Campbell, B., Weibe, S., MacDonald, R. J., & McAuley, A. (2012). The role of digital technologies in learning: expectations of first year university students. *Canadian Journal of Learning and Technology*, 38(1), 1–18.
- Galambos, N. L., Barker, E. T., & Krahn, H. J. (2006). Depression, self-esteem, and anger in emerging adulthood: seven-year trajectories. *Developmental Psychology*, 42(2), 350–365. <http://dx.doi.org/10.1037/0012-1649.42.2.350>.
- Giglietto, F., & Selva, D. (2014). Second screen and participation: a content analysis on a full season dataset of tweets. *Journal of Communication*, 64(2), 260–277. <http://dx.doi.org/10.1111/jcom.12085>.
- Hull, C. L. (1943). *Principles of behavior*. New York, NY: Appleton-Century.
- Hwang, Y., Kim, H., & Jeong, S. H. (2014). Why do media users multitask? Motives for general, medium-specific, and content-specific types of multitasking. *Computers in Human Behavior*, 36, 542–548. <http://dx.doi.org/10.1016/j.chb.2014.04.040>.
- Jackson, T., Soderlund, A., & Weiss, K. E. (2000). Personality traits and quality of relationships as predictors of future loneliness among American college students. *Social Behavior and Personality*, 28(5), 463–470. <http://dx.doi.org/10.2224/sbp.2000.28.5.463>.
- Jeong, S.-H., & Fishbein, M. (2007). Predictors of multitasking with media: media factors and audience factors. *Media Psychology*, 10(3), 364–384. <http://dx.doi.org/10.1080/15213260701532948>.
- Junco, R. (2012). In-class multitasking and academic performance. *Computers in Human Behavior*, 28(6), 2236–2243. <http://dx.doi.org/10.1016/j.chb.2012.06.031>.
- Junco, R., & Cotten, S. R. (2012). No A 4 U: the relationship between multitasking and academic performance. *Computers & Education*, 59(2), 505–514. <http://dx.doi.org/10.1016/j.compedu.2011.12.023>.
- Kool, W., McGuire, J. T., Rosen, Z. B., & Botvinick, M. M. (2010). Decision making and the avoidance of cognitive demand. *Journal of Experimental Psychology: General*, 139, 665–682. <http://dx.doi.org/10.1037/a0020198>.
- Ladd, G. W. (2006). Peer rejection, aggressive or withdrawn behavior, and psychological maladjustment from ages 5 to 12: an examination of four predictive models. *Child Development*, 77(4), 822–846. <http://dx.doi.org/10.1111/j.1467-8624.2006.00905.x>.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, 50(1), 46–70. <http://dx.doi.org/10.1111/j.1460-2466.2000.tb02833.x>.
- Misra, S., Cheng, L., Genevieve, J., & Yuan, M. (2014). The iPhone effect the quality of in-person social interactions in the presence of mobile devices. *Environment and Behavior*, 1–24. <http://dx.doi.org/10.1177/0013916514539755>.
- Moreno, R., & Mayer, R. E. (1999). Cognitive principles of multimedia learning: the role of modality and contiguity. *Journal of Educational Psychology*, 91(2), 358.
- Nangle, D. W., Erdley, C. A., Newman, J. E., Mason, C. A., & Carpenter, E. M. (2003). Popularity, friendship quantity, and friendship quality: Interactive influences on children’s loneliness and depression. *Journal of Clinical Child And Adolescent Psychology*, 32(4), 546–555.
- Nielsen. (2013). *A look across screens. The cross-platform report*. New York. Retrieved from <http://www.nielsen.com/us/en/reports/2013/the-cross-platform-report-a-lookacross-screens.html>.
- Nowak, K. L., Watt, J., & Walther, J. B. (2009). Computer mediated teamwork and the efficiency framework: exploring the influence of synchrony and cues on media satisfaction and outcome success. *Computers in Human Behavior*, 25(5), 1108–1119. <http://dx.doi.org/10.1016/j.chb.2009.05.006>.
- Ofcom and GfK. (2010). *The consumer’s digital day*. Retrieved from: <http://stakeholders.ofcom.gov.uk/binaries/research/811898/consumers-digital-day.pdf>.
- Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences*, 106(37), 15583–15587. <http://dx.doi.org/10.1073/pnas.0903620106>.
- Pea, R., Nass, C., Meheula, L., Rance, M., Kumar, A., Bamford, H., et al. (2012). Media use, face-to-face communication, media multitasking, and social well-being among 8- to 12-year-old girls. *Developmental Psychology*, 48(2), 327–336. <http://dx.doi.org/10.1037/a0027030>.

- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, 18(2), 189–193. <http://dx.doi.org/10.1097/00001504-200503000-00013>.
- Perkins, H. W. (2002). Social norms and the prevention of alcohol misuse in collegiate contexts. *Journal of Studies on Alcohol and Drugs, Supplement*, 14, 164–172. <http://dx.doi.org/10.15288/jsas.2002.s14.164>.
- Pinquart, M., & Sörensen, S. (2000). Influences of socioeconomic status, social network, and competence on subjective well-being in later life: a meta-analysis. *Psychology and Aging*, 15(2), 187–224. <http://doi.org/10.1037/0882-7974.15.2.187>.
- Pintrich, P. R., & de Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33–40. <http://dx.doi.org/10.1037/0022-0663.82.1.33>.
- Przybylski, A. K., & Weinstein, N. (2013). Can you connect with me now? how the presence of mobile communication technology influences face-to-face conversation quality. *Journal of Social and Personal Relationships*, 30(3), 237–246. <http://dx.doi.org/10.1177/0265407512453827>.
- Qualtrics. (2013). *Qualtrics research suite (Version 43051)* (Computer software). Provo, UT: Qualtrics.
- Reis, H. T., & Shaver, P. (1988). Intimacy as an interpersonal process. In S. Duck, D. F. Hay, S. E. Hobfoll, W. Ickes, & B. M. Montgomery (Eds.), *Handbook of personal relationships: Theory, research and interventions* (pp. 367–389). Oxford, England: John Wiley & Sons.
- Reno, R. R., Cialdini, R. B., & Kallgren, C. A. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology*, 64, 104–112. <http://dx.doi.org/10.1037/0022-3514.64.1.104>.
- Rhodes, N., & Ewoldsen, D. R. (2009). Attitude and norm accessibility and cigarette smoking. *Journal of Applied Social Psychology*, 39, 2355–2372. <http://dx.doi.org/10.1111/j.1559-1816.2009.00529.x>.
- Ridder, D. T. D. de, Lensvelt-Mulders, G., Finkenauer, G., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: a meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, 16(1), 76–99. <http://dx.doi.org/10.1177/1088868311418749>.
- Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). *Generation M²: Media in the lives of 8- to 18-year-olds*. Menlo Park, CA: Kaiser Family Foundation. Retrieved from <https://kaiserfamilyfoundation.files.wordpress.com/2013/01/8010.pdf>.
- Rosen, L. D., Mark Carrier, L., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior*, 29(3), 948–958. <http://dx.doi.org/10.1016/j.chb.2012.12.001>.
- Salvucci, D. D., & Taatgen, N. A. (2008). Threaded cognition: an integrated theory of concurrent multitasking. *Psychological Review*, 115(1), 101–130. <http://dx.doi.org/10.1037/0033-295X.115.1.101>.
- Sanbonmatsu, D. M., Strayer, D. L., Medeiros-Ward, N., & Watson, J. M. (2013). Who multi-tasks and why? multi-tasking ability, perceived multi-tasking ability, impulsivity, and sensation seeking. *PLoS One*, 8(1), e54402. <http://dx.doi.org/10.1371/journal.pone.0054402>.
- Shih, S.-I. (2013). A null relationship between media multitasking and well-being. *PLoS One*, 8(5), e64508. <http://dx.doi.org/10.1371/journal.pone.0064508>.
- Shim, H., Oh, P., Song, H., & Lee, Y. (2015). An exploration of motivations for two screen viewing, social interaction behaviors, and factors that influence viewing intentions. *Cyberpsychology, Behavior, and Social Networking*, 18(3), 158–164. <http://dx.doi.org/10.1089/cyber.2014.0543>.
- Slater, M. D. (2007). Reinforcing spirals: the mutual influence of media selectivity and media effects and their impact on individual behavior and social identity. *Communication Theory*, 17(3), 281–303. <http://dx.doi.org/10.1111/j.1468-2885.2007.00296.x>.
- Srivastava, J. (2013). Media multitasking performance: role of message relevance and formatting cues in online environments. *Computers in Human Behavior*, 29(3), 888–895. <http://dx.doi.org/10.1016/j.chb.2012.12.023>.
- St Peters, M., Huston, A. C., & Wright, J. C. (1989). *Television and families: Parental coviewing and young children's language development, social behavior, and television processing*. Retrieved from <http://files.eric.ed.gov/fulltext/ED312040.pdf>.
- Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72(2), 271–324. <http://dx.doi.org/10.1111/j.0022-3506.2004.00263.x>.
- Turkle, S. (2012). *Alone together: Why we expect more from technology and less from each other*. New York, NY: Basic Books.
- Walther, J. B. (1996). Computer-mediated communication impersonal, interpersonal, and hyperpersonal interaction. *Communication Research*, 23(1), 3–43. <http://dx.doi.org/10.1177/009365096023001001>.
- Wang, Z. (2014). Bridging media processing and selective exposure: a dynamic motivational model of media choices and choice response time. *Communication Research*, 41(8), 1064–1087. <http://dx.doi.org/10.1177/0093650214534963>.
- Wang, Z., David, P., Srivastava, J., Powers, S., Brady, C., D'Angelo, J., et al. (2012). Behavioral performance and visual attention in communication multitasking: a comparison between instant messaging and online voice chat. *Computers in Human Behavior*, 28(3), 968–975. <http://dx.doi.org/10.1016/j.chb.2011.12.018>.
- Wang, Z., Irwin, M., Cooper, C., & Srivastava, J. (2015). Multidimensions of media multitasking and adaptive media selection. *Human Communication Research*, 41, 102–127. <http://dx.doi.org/10.1111/hcre.12042>.
- Wang, Z., Lang, A., & Busemeyer, J. R. (2011). Motivational processing and choice behavior during television viewing: an integrative dynamic approach. *Journal of Communication*, 61, 72–94. <http://dx.doi.org/10.1111/j.1460-2466.2010.01527.x>.
- Wang, Z., & Tchernev, J. M. (2012). The “myth” of media multitasking: reciprocal dynamics of media multitasking, personal needs, and gratifications. *Journal of Communication*, 62(3), 493–513. <http://dx.doi.org/10.1111/j.1460-2466.2012.01641.x>.
- Wang, Z., Tchernev, J. M., & Solloway, T. (2012). A dynamic longitudinal examination of social media use, needs, and gratifications among college students. *Computers in Human Behavior*, 28(5), 1829–1839. <http://dx.doi.org/10.1016/j.chb.2012.05.001>.
- Ward, L. M. (2002). *Dynamical cognitive science*. Cambridge, MA: MIT Press.
- Wickens, C. D. (2002). Multiple resources and performance prediction. *Theoretical Issues in Ergonomics Science*, 3(2), 159–177. <http://dx.doi.org/10.1080/14639220210123806>.
- Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multi-tasking with technology on real-time classroom learning. *Computers & Education*, 58(1), 365–374. <http://dx.doi.org/10.1016/j.compedu.2011.08.029>.
- Zhang, W., & Zhang, L. (2012). Explicating multitasking with computers: gratifications and situations. *Computers in Human Behavior*, 28, 1883–1891. <http://dx.doi.org/10.1016/j.chb.2012.05.006>.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: an overview. *Theory into Practice*, 41(2), 64–70.