Juggling with media

The consequences of media multitasking for adolescent development

van der Schuur, W.A.

General Discussion

Concerns regarding the adverse impact of media multitasking on adolescent development have become increasingly prevalent in today's society (e.g., Wallis, 2010). Consequently, empirical research on this topic has grown rapidly over the past twenty years (e.g., Becker, Alzahabi, & Hopwood, 2013; Junco & Cotten, 2012; Ophir, Nass, Wagner, 2009). However, clear evidence of the actual impact of media multitasking on adolescent development remained limited, due to two main gaps in the current literature. First, the media multitasking literature was largely fragmented (e.g., Kazakova, Cauberghe, Pandelaere, & de Pelsmacker, 2015), which hindered the possibility to draw a clear picture of the relationship between media multitasking and adolescent development. Second, evidence for the longitudinal relationship between media multitasking and adolescent development was lacking.

The present dissertation set out to address these gaps in the current literature. The first main aim was to investigate the state of the art in the media multitasking literature, with respect to the possible negative consequences of media multitasking for adolescent development. To examine this, we conducted a review of the scientific media multitasking literature (Chapter 1). The second main aim was to investigate the longitudinal relationships between media multitasking and multiple domains of adolescent development. Therefore, Chapters 2 to 4 are based on a three-wave longitudinal study among 1,440 Dutch adolescents (11-15 years old). By focusing on these two aims, this dissertation clarifies and extends our current knowledge of the possible consequences of media multitasking for adolescent development. Furthermore, the findings of this dissertation have important practical implications and provide critical directions for future research.

The State of the Art: Cross-sectional Relationships between Media Multitasking and Adolescent Development

Chapter 1 demonstrated that the extant literature has largely focused on the impact of media multitasking on three developmental domains, that is cognitive control, academic performance, and socioemotional functioning. Although the findings were partly mixed, the majority of the studies published between 1994 and 2014 provided support for a small to moderate cross-sectional association between media multitasking and the three developmental domains. Specifically, research demonstrated that media multitasking was negatively associated with cognitive control (e.g., Baumgartner, Weeda, van der Heijden, & Huizinga, 2014; Ophir et al, 2009), academic performance (e.g., Junco & Cotten, 2012; Rosen, Carrier, & Cheever, 2013), and socioemotional functioning (e.g., Becker et al., 2013; Pea et al., 2012).

Although these studies have provided first insights regarding the cross-sectional relationship between media multitasking and various developmental domains, the review in Chapter 1 also underscored the need for research on adolescent media multitasking. Previous studies have primarily used convenience and college student samples (Becker et al., 2013; Junco & Cotten, 2012; Ophir et al, 2009). Only a few studies had specifically

d

focused on adolescents (e.g., Baumgartner et al., 2014; Calamaro, Mason, & Ratcliffe, 2009; Pool, van der Voort, Beentjes, & Koolstra, 2000), which is surprising because media multitasking is especially prevalent among adolescents (e.g., Carrier, Cheever, Rosen, Benitez, & Chang, 2009; Voorveld & van der Goot, 2013). Consequently, evidence regarding the cross-sectional link between media multitasking and these developmental domains among adolescents was lacking. Therefore, it was important to also examine whether these cross-sectional relationships observed in student samples could also be observed in a representative adolescent sample.

In line with the main findings of Chapter 1, Chapters 2 to 4 showed that media multitasking had a small to moderate relationship with adolescents' development. First, Chapter 2 showed that academic-media multitasking (i.e., media use during homework and while attending class) was positively associated with academic attention problems and negatively associated with academic achievement scores. In other words, adolescents who frequently used media during academic activities reported more academic attention problems and had lower academic achievement scores, compared to adolescents who engaged less frequently in academic-media multitasking. Second, Chapter 3 demonstrated that technological interferences during offline conversations (TIDOC) were negatively related to adolescents' emotional problems. Specifically, more frequent media use during offline conversations was related to more emotional problems. Finally, Chapter 4 illustrated that media-media multitasking (i.e., the simultaneous use of multiple media) was related to more sleep problems among adolescents. Together, the findings of this dissertation clearly show that media multitasking and adolescent development are cross-sectionally related.

Unchartered Territories: Longitudinal Relationships between Media Multitasking and Adolescent Development

As demonstrated by Chapter 1, research on the possible impact of media multitasking on developmental domains was mostly cross-sectional. Therefore, evidence for the causality between media multitasking and the three developmental domains was lacking. This is problematic because societal concerns typically evolve around the idea that media multitasking is the cause of an unhealthy development. For example, researchers have assumed that media multitasking during academic activities leads to lower academic achievement scores. However, cross-sectional relationships do not allow researchers to make such conclusions. A cross-sectional relationship merely supports the idea that the two variables are related. Thus, it could, for example, also be that media multitasking does not deteriorate students' academic achievement but that students with lower grades are more prone to engage in media multitasking. Therefore, in Chapters 2 to 4 took an important first step towards understanding the causal relationships between media multitasking and adolescent development by investigating the relationships longitudinally. Specifically, these chapters examined longitudinal relationships between media multitasking and three aspects of adolescent development; their academic achievement, their emotional

problems, and their sleep problems.

1 **At the between-person level, media multitasking and the three aspects of adolescent development were negatively related**.

The relationship at the between-person level represents the correlation between the stable rank order position of an individual on media multitasking and the stable rank order of that individual on adolescent development across the school year. These between-person relationships are comparable with the correlations between media multitasking and adolescent development examined in cross-sectional studies, because these correlations are based on the rank order positions of each variable at one specific time point. However, these relationships at the between-person level reflect a more reliable estimate of this relationship, as it entails the correlation between the stable position of an adolescent on media multitasking and the stable position of an adolescent on the outcome variable across the three assessment points during one school year.

The findings of Chapters 2 to 4 showed that media multitasking and the developmental domains were negatively related across the school year. These relationships were small to moderate. Chapter 2 showed that academic-media multitasking was related to both more academic attention problems and lower academic achievement scores. Chapter 3 demonstrated that TIDOC was positively related to emotional problems. Chapter 4 showed that media-media multitasking was positively associated with sleep problems. Thus, similar to the cross-sectional relationships among adults found in previous studies, these results demonstrate that adolescents who more frequently engage in media multitasking show more problems in certain aspects of their development compared to adolescents who less often report media multitasking.

2 **At the within-person level, media multitasking sometimes, but not always, negatively predicted adolescent development**.

As the concerns about media multitasking specifically focus on the impact of media multitasking on adolescent development, researchers have been mainly interested in the within-person impact of media multitasking on adolescents' development. This means that we want to know if a rise in media multitasking of a specific adolescent predicts more difficulties in certain developmental domains over time of this specific adolescent. For example, if an adolescent uses more media during academic activities, does this adversely affect his/her academic achievement?

The findings of this dissertation showed that media multitasking sometimes, but not always, predicted adolescent development at the within-person level. In contrast to the expectations, this dissertation showed that academic-media multitasking was not related

d

to academic achievement scores over time (Chapter 2) and that TIDOC was not related to adolescents' emotional problems over time (Chapter 3). This means that an increase in these two types of media multitasking behaviors did not further impair adolescents' academic achievement scores nor their emotional problems. However, we did find evidence for small longitudinal relationships between media multitasking and subsequent adolescent development on two other developmental domains. First, an increase in academic-media multitasking did predict more academic attention problems over time (Chapter 2). This indicates that if an adolescent more often used media during academic activities this further deteriorated his/her ability to pay attention during academic activities. Second, Chapter 4 demonstrated that when early adolescents and girls more often used multiple media simultaneously this predicted an increase in their sleep problems.

3 **At the within-person level, the three aspects of adolescent development did not predict an increase in media multitasking**.

Although the common assumption is that media multitasking hinders adolescent development (e.g., Wallis, 2010), some researchers have argued that this relationship could also be reversed (e.g., Becker et al., 2013; Junco & Cotton, 2012). This means that problems in adolescent development may result in more media multitasking over time. For example, as discussed in Chapter 1, adolescents with lower academic achievement scores may be less motivated at school and when doing homework (Richardson, Abraham, & Bond, 2012). This could result in more frequent media use during academic activities because these adolescents may be less motivated to refrain from using media during these activities. Similarly, when adolescents experience sleep problems they could be more prone to engage in media multitasking. Sleep problems may hinder adolescents' executive functions, which are cognitive processes that help individuals to control their attention and behavior (e.g., Ferraro, Holfeld, Frankl, Frye, & Halvorson, 2015; Gruber, Cassoff, Frenette, Wiebe, & Carrier, 2012). Difficulties in these executive functions are in turn known to positively predict media multitasking (e.g., Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013; Yang & Zhu, 2016). Therefore, in this dissertation we also investigated the reversed relationships. However, difficulties in the developmental domains studied in this dissertation (i.e., academic attention problems, academic achievement scores, emotional problems, and sleep problems) did not predict an increase in media multitasking over time.

What do these Findings Mean?
All chapters of this dissertation clearly show that media multitasking and adolescent development are related at the between-person level, indicating that adolescents who more often engage in media multitasking also show more difficulties in the different developmental domains. However, findings at the within-person level, related to the general assumption that media multitasking actually hinders adolescent development over time are more nuanced. Specifically, we found that specific types of media multitasking

predicted an increase in academic attention problems and sleep problems, but not academic achievement scores and emotional problems. This means that although media multitasking is consistently related to all of these developmental domains, more frequently engaging in media multitasking seems to only further deteriorate adolescents' academic attention problems and sleep problems.

The reason for why this dissertation only shows support for the effects of media multitasking on some of the developmental domains could be that media multitasking only plays a small part in adolescent development. As Bronfenbrenner (1979) argued, multiple environmental factors are likely to influence the development of children and adolescents. Media multitasking in this respect is only one aspect of a wide array of environmental factors that play a role in adolescent development. Therefore, media multitasking effects are expected to be small and could be overflowed by other factors that are more important for adolescent development. Considering the developmental outcomes in this dissertation, both academic achievement and emotional problems are quite extreme measures of adolescent development and are likely influenced by multiple other factors that are more important than media multitasking. Academic attention problems and sleep problems may be seen as less extreme measures of adolescent development, and therefore could be more amendable for effects of media multitasking.

The nuanced findings of the impact of media multitasking on adolescent development also point to the role of individual differences in this relationship. Specifically, communication researchers have repeatedly stressed that individuals differ in their susceptibility to media effects (e.g., Bandura, 2001; Slater, 2015; Valkenburg & Peter, 2013). Therefore, it is likely that the relationships between media multitasking and the developmental domains differ among adolescents as well. This could explain why the overall relationships between media multitasking and adolescent development are generally small, or even absent. Whereas some adolescents may be particularly susceptible for media multitasking effects, others may experience no effects of media multitasking. Chapter 4 provided first evidence for the differences among adolescents, as this chapter showed that media multitasking only predicted sleep problems among early adolescents and girls. However, this has only been a first step in understanding the wide variability in the impact of media multitasking on adolescent development.

Together, the findings of this dissertation suggest that although there might be no reason to panic, the findings do suggest that there is a reason for caution regarding the impact of media multitasking on adolescent development. As adolescent development is dependent on many factors, media multitasking can still play a role. Specifically, our findings suggest that media multitasking may interfere with academic attention problems and sleep problems, which are both highly important for the healthy development of adolescents (e.g., Eisenberg, Hofer, & Vaughan, 2007; Shochat, Cohen-Zion, & Tzischinsky, 2014). However,

d

considering the small or even absent relationships, it is likely that media multitasking is not disruptive for all adolescents, but some adolescents may be particularly susceptible for media multitasking effects.

A Theoretical Framework on the Underlying Mechanisms

While this dissertation focused on examining the consequences of media multitasking for adolescent development, the chapters also took first steps in extending the theoretical reasoning regarding this relationship. Chapter 1 showed that explanations on the effects of media multitasking on the developmental domains often remained vague. Therefore, in this dissertation we theoretically delineated potential underlying mechanisms that may explain media multitasking effects. Focusing on the possible underlying mechanisms of the relationship between media multitasking and adolescent development has yielded important insights regarding a theoretical framework of media multitasking effects. Together, the chapters of this dissertation point towards two underlying pathways that may explain the possible impact of media multitasking on adolescent development (see Figure 1). Both pathways are based on theoretical explanations discussed throughout this dissertation and therefore need to be tested in future research.

The 1ˢᵗ pathway: The displacement hypothesis and disruption hypothesis. The first pathway includes the impact of specific types of media multitasking on specific aspects of adolescent development. This dissertation shows that researchers are advised to distinguish between specific types of media multitasking, such as academic-media multitasking, media use during offline conversations, and media-media multitasking. These types of media multitasking have specific characteristic that can explain the effects of media multitasking on specific aspects of adolescent development. More specifically, this dissertation emphasized that the specific types of media multitasking may affect specific aspects of adolescent development, through *displacement* and/or *disruption of* a specific activity.

The displacement hypothesis assumes that the time spent on media and communication devices, displaces the time spent on specific activities (e.g., Fox, Rosen, & Crawford, 2009; McDaniel & Coyne, 2016). In the case of media multitasking, using media may directly displace an activity that could be beneficial for adolescent development. For example, as discussed in Chapter 2, media use during homework could displace the time spent on the particular homework task (e.g., Fox et al, 2009), which subsequently may hinder adolescents' academic achievement. Similarly, media use during an offline conversation with friends may displace the time spent on the conversation (McDaniel & Coyne, 2016), which in turn may hinder the development of friendships.

The *displacement* hypothesis assumes that the time spent on media and communication devices, displaces the time spent on specific activities (e.g., Fox, Rosen, & Crawford, 2009;

McDaniel & Coyne, 2016). In the case of media multitasking, using media may directly displace an activity that could be beneficial for adolescent development. For example, as discussed in Chapter 2, media use during homework could displace the time spent on the particular homework task (e.g., Fox et al, 2009), which subsequently may hinder adolescents' academic achievement. Similarly, media use during an offline conversation with friends may displace the time spent on the conversation (McDaniel & Coyne, 2016), which in turn may hinder the development of friendships.
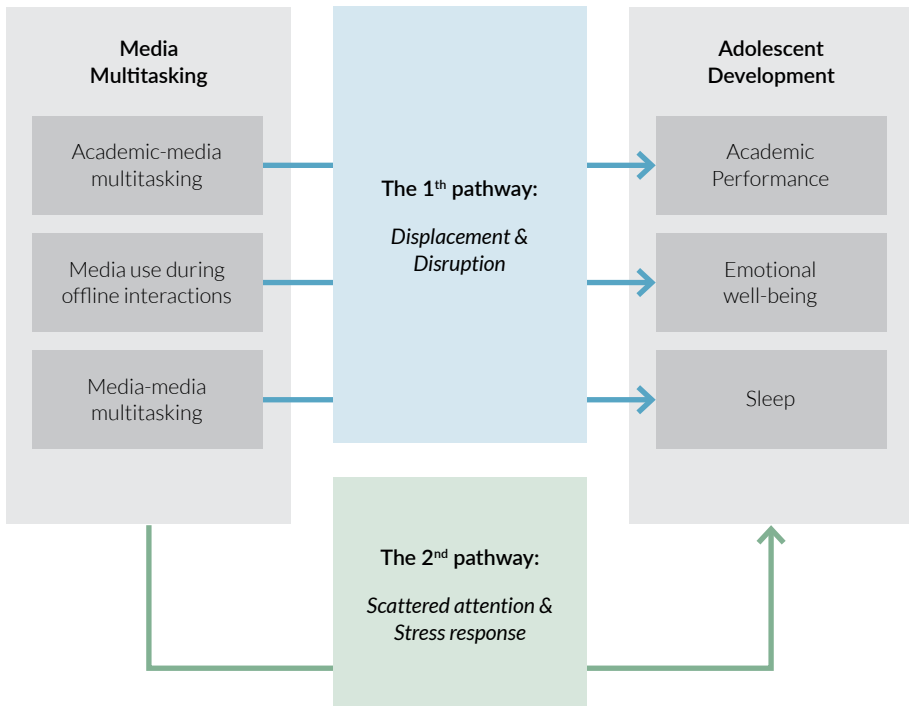

Figure 1. A representation of the two pathways to explain the possible consequences of media multitasking for adolescent development.

The *disruption* hypothesis posits that specific types of media multitasking disrupt specific activities that are beneficial for adolescent development. For example, it is widely acknowledged that people have limited cognitive capacities (e.g., Lang, 2000, 2006), which means that when people are exposed to multiple streams of information they may not process this information sufficiently. Therefore, when adolescents use media during non-media activities, which is the case for academic-media multitasking and TIDOC, this may disrupt processing the information of these non-media activities (i.e., academic activity and offline conversation). For example, with respect to media use during offline conversations, adolescents who use media during an offline interaction have to process both the content

of the media (e.g., reading a text message) and the content of the offline interaction. Consequently, adolescent may insufficiently process information of the conversation partner, which is likely to disrupt the offline interaction. However, such positive offline conversations are needed for a healthy emotional development as discussed in Chapter 3.

The 2nd pathway: The scattered attention hypothesis and stress response hypothesis. The second pathway focuses on how the common characteristics of media multitasking, rather than the specific types of media multitasking, can influence adolescent development. Independent of the relationship between specific types of media multitasking and the specific aspects of adolescent development, the common characteristics of media multitasking may also hinder adolescent development. There are two common characteristics that were discussed throughout this dissertation. First, we repeatedly argued, that the different types of media multitasking are all characterized by the rapid switching between tasks. Second, another common characteristic is that the constant switching between tasks is assumed to be cognitively demanding. In this dissertation, the two common characteristics of media multitasking have been linked to different underlying mechanisms. The constant switching between activities may result in more attention problems (i.e., *scattered attention* hypothesis), whereas the cognitive demanding nature of media multitasking may enhance adolescents' stress levels (i.e., *stress response* hypothesis).

In Chapter 1 and 2, the *scattered attention* hypothesis was introduced. This hypothesis posits that frequently engaging in media multitasking may lead to attention problems (Baumgartner et al., 2014; Baumgartner, van der Schuur, Lemmens, & te Poel, 2017; Ophir et al., 2009). Adolescents who repeatedly engage in media multitasking may eventually get habituated to respond to ongoing distractions in everyday situations. For example, these adolescents may experience more problems in ignoring irrelevant information and sustaining attention on the primary activity, because they are accustomed to respond to ongoing distractions (Ophir et al., 2009). These deficits in attention due to media multitasking may interfere with adolescents' ability to sustain attention on an academic activity (e.g., Ophir et al., 2009; Wallis, 2010), or to regulate their emotions (Eisenberg et al., 2007).

In Chapter 3 and 4, the *stress response* hypothesis was included to explain the impact of media-media multitasking on sleep and the impact of TIDOC on emotional problems. The different types of media multitasking may all elicit stress. Stress encompasses the extent to which individuals perceive that they are unable to cope with everyday life situations (Cohen, Kamarck, & Mermelstein, 1983). The transactional theory of stress (Lazarus & Folkman, 1987) assumes that cognitively demanding activities are more likely to evoke stress responses because it is more difficult to cope with these demands. As media multitasking is cognitively demanding due to multiple incoming streams of information (Lang, 2000, 2006), media multitasking is likely to result in stress. Research on media-media multitasking

has already shown that using multiple media simultaneously is positively associated with stress, including both physiological and subjective measures (Mark, Wang, & Niiya, 2014). Therefore, independent of the type of media multitasking adolescents engage in, it may be assumed that the common characteristics of media multitasking deteriorate adolescents' attentional processes and increases their stress levels.

Both attention and stress have, however, an important impact on different aspects of adolescent development (e.g., Galambos, Howard, & Maggs, 2011; Hankin, Wetter, & Flory, 2012; Polderman, Boomsma, Bartels, Verhulst, & Huizink, 2010; Wiklund, Malmgren-Olsson, Öhman, Bergström, & Fjellman-Wiklund, 2012), and may thus hinder their healthy development. Together, this may explain why the common characteristics of the specific types of media multitasking may hinder adolescent development.

Practical Implications

Media and communication devices will become increasingly integrated into adolescents' lives. For example, it is likely that there will be more mobile devices and more Wi-Fi spots in the future. This will even further enhance adolescents' possibilities to engage in media multitasking. Therefore, it is expected that media multitasking will continue to rise among adolescents. Consequently, the question of how adolescents should deal with the omnipresence of media and communication devices becomes increasingly important in the upcoming years.

Although the first reaction of people may be to restrict the use of media and communication devices, researchers have already argued that the banning of these devices is not the best answer for two main reasons. First, many media and communication technologies play a positive role in adolescents' lives. For today's adolescents, the use of media and communication devices has become an important part of their daily life. For example, they use search engines to make homework and keep in touch with friends via social media. Studies have demonstrated that using media and communication devices can be beneficial for adolescent development (e.g., Reinecke, Vorderer, & Knop, 2014; Valkenburg & Peter, 2011). For example, using social media can be beneficial for adolescents' emotional well-being (Reinecke et al., 2014). Second, studies have shown that when taking the devices 'out of sight' they may not be 'out of mind' (Cheever, Rosen, Carrier, & Chavez, 2014; Clayton, Leshner, & Almond, 2015). Specifically, Cheever and colleagues showed that when mobile devices were taken away from college students, they reported higher levels of anxiety, than when adolescents were allowed to use these devices. Similarly, another study showed that when college students were separated from their smartphones, not being able to answer their ringing phone resulted in higher levels of anxiety and lower performance on a cognitive task (Clayton et al., 2015). Thus, even when devices are taken away from young people, they may still be preoccupied with these devices.

d

As simply restricting the use of media and communication devices is likely not the answer, it may be more important to focus on developing evidence-based programs that teach adolescents to cope with the omnipresence of these devices. Such programs could, for example, focus on both individual skills as well as the direct environment of the adolescents. With respect to the individual skills, particularly two skills may be particularly important. First, adolescents may benefit from increased awareness of their media use. Researchers have shown that media multitasking is often habitual, and that adolescents are often not aware of their media multitasking behaviors (LaRose, Lin, & Eastin, 2003). To change these behaviors, adolescents first need to be aware of their usage. Second, it may be helpful to increase adolescents' self-control. Self-control refers to an individual's ability to inhibit desires that may stand in the way of a specific goal (Hofmann, Baumeister, Förster, & Vohs, 2012; Hofmann & Kotabe, 2012). A lack in self-regulation has been associated with more media multitasking (Sanbonmatsu et al., 2013; Wei, Wang, & Klausner, 2012; Zhang, 2015). Therefore, enhancing adolescents' self-control may help adolescents to deal with ongoing media distractions. Taken together, both skills may help adolescents to use media and communication devices in a more beneficial way.

As for the direct environment of adolescents, it may be beneficial for adolescents when their environment supports adolescents' in coping with the omnipresence of media and communication devices. Although adolescents become increasingly independent during this developmental stage, parent and teachers still pay a critical role in their lives (Dishion & McMahon, 1998). Particularly because adolescents continue to develop critical aspects of their self-control skills (Crone & Dahl, 2012), parents and teachers play an important role in guiding adolescents to cope with the saturated media environment. For example, parents are advised to set clear and consistent rules about media use, whereby they should take into account their child's perspective and needs (Valkenburg, Piotrowski, Hermanns, & Leeuw, 2013). In addition, researchers suggest that parents could be important role models for adolescents' media use (Vaala & Bleakley, 2015). Therefore, it may be important that parents and teachers set the right example by, for example, not using their smartphones during family meals or when talking with others.

Future Directions for Researchers

This dissertation clearly showed that media multitasking and adolescents' development are cross-sectionally related. Although support for the impact of media multitasking on adolescent development was less conclusive, this dissertation provided first evidence for the negative effect of media multitasking on some aspects of adolescent development, that is their academic attention problems and sleep problems. Future studies are necessary to further understand the consequences of media multitasking for adolescent development. As communication researchers increasingly acknowledge that media effects are highly complex, attention for advanced theoretical models is growing (e.g., Hepp, Hjarvard, & Lundby, 2015; Valkenburg & Peter, 2013). In the media multitasking field, a clear theoretical

framework is often lacking and the complexity of media multitasking effects may not be fully captured by the way we are currently collecting and analyzing our data. There are three main directions that researchers could pursue to enhance our theoretical understanding of media multitasking effects and grasp its complexity: examining underling mechanisms, taking time into account, and investigating individual differences.

First, future studies should advance our understanding of the underlying mechanisms of media multitasking on adolescent development by empirically testing these mechanisms. This dissertation focused on examining the consequences of media multitasking for adolescent development. However, the chapters also extended the reasoning regarding the underlying mechanism of the possible effects of media multitasking on adolescent development as displayed in Figure 1. Researchers are advised to test these underlying mechanisms. Specifically, to date, we do not know which of the underlying mechanisms is most important, or if multiple underlying mechanisms play a role.

Second, researchers are advised to pay more attention to the time in which media multitasking effects occur. Although changes in individuals typically occur continuously, researchers have to depend on "snapshots" of these changes (Voelkle, Oud, Davidov, & Schmidt, 2012). Presently, communication researchers mainly turn to experimental or panel designs to answer questions of causality. While experimental designs typically examine the immediate effects, panel designs often include times spans of over 6 months or more. However, the time frame in which an effect occurs is probably dependent on the type of media use and the outcome that is examined. For example, Chapter 4 showed no support for the impact of sleep problems on media multitasking, while Mark, Wang, Niiya, and Reich (2016) found that adolescents who experienced more sleep problems reported more media multitasking the next day. This may suggest that sleep problems have an immediate effect on media multitasking, instead of a more long-term effect. In addition, while experimental studies showed that academic-media multitasking can hinder academic achievement directly after the academic activity, Chapter 2 showed no support for a long-term relationship. Therefore, to examine the impact of media multitasking on adolescent development it may be important to take time into account in future studies. This also calls for different data collections methods, such as experience sampling studies, and advanced statistical techniques, such as continuous time sampling and time series (Voelkle et al., 2012).

Third, researchers are advised to further examine individual differences. Communication researchers have repeatedly emphasized the need for examining individual differences when investigating media effects (Bandura, 2001; Slater, 2015; Valkenburg & Peter, 2013). This has resulted in more attention to these individual differences. However, in the field of media multitasking, attention for individual differences is limited. To take a first step in examining individual differences, this dissertation examined possible demographic

d

moderators, specifically age and biological sex. This dissertation showed that age and sex indeed moderated the relationship between media multitasking and sleep problems. However, examining single or a few moderators are likely to only grasp a small part of the individual differences. Therefore, to really understand the complexity of individual differences, it may be important to consider a bottom-up approach. For example, researchers could identify adolescents that show negative relationships between media multitiasking and adolescent development and examine the characteristic of these adolescents. For example, by investigating if common demographic, personal, and contextual factors that may explain the negative patterns found among this subgroup of adolescents do differ.

CONCLUSION

As a consequence of the growing concerns that media multitasking hinders adolescent development, the overarching goal of this dissertation was to enhance our knowledge of the relationship between media multitasking and adolescent development. This dissertation suggests that the concerns about the potential detrimental impact of media multitasking may be exaggerated. Although the studies consistently found support for a link between media multitasking and adolescent development, evidence for the actual impact of media multitasking on adolescent development is less conclusive. Specifically, the results showed that media multitasking may hinder some, but not all, aspects of adolescent development. However, examining the consequences of media multitasking for adolescent development in the future stays important. As the role of media and communication devices is expected to grow even further, it will be increasingly important to understand its impact on adolescent development and teach adolescents how to cope with the omnipresence of these devices.

d

REFERENCES

Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology, 3*, 265-299. doi:10.1207/S1532785XMEP0303_03

Baumgartner, S. E., van der Schuur, W. A., Lemmens, J. S., & te Poel, F. (2017). The relationship between media multitasking and attention problems in adolescents: Results of two longitudinal studies. *Human Communication Research.* Advance online publication. doi:10.1111/hcre.12111

Baumgartner, S. E., Weeda, W. D., van der Heijden, L. L., & Huizinga, M. (2014). The relationship between media multitasking and executive function in early adolescents. *The Journal of Early Adolescence, 34*, 1120 - 1144. doi:10.1177/0272431614523133

Becker, M. W., Alzahabi, R., & Hopwood, C. J. (2013). Media multitasking is associated with symptoms of depression and social anxiety. *Cyberpsychology, Behavior, and Social Networking, 16*, 132-135. doi:10.1089/cyber.2012.0291

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press

Calamaro, C. J., Mason, T. B., & Ratcliffe, S. J. (2009). Adolescents living the 24/7 lifestyle: Effects of caffeine and technology on sleep duration and daytime functioning. *Pediatrics, 123*, e1005-e1010. doi:10.1542/peds.2008-3641

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*, 483-489. doi:10.1167/10.7.260

Cheever, N. A., Rosen, L. D., Carrier, L. M., & Chavez, A. (2014). Out of sight is not out of mind: The impact of restricting wireless mobile device use on anxiety levels among low, moderate and high users. *Computers in Human Behavior, 37*, 290-297. doi:10.1016/j.chb.2014.05.002

Clayton, R. B., Leshner, G., & Almond, A. (2015). The extended iSelf: The impact of iPhone separation on cognition, emotion, and physiology. *Journal of Computer-Mediated Communication, 20*, 119-135. doi:10.1111/jcc4.12109

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385-396.

Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social-affective engagement and goal flexibility. *Nature Reviews Neuroscience, 13*, 636-650. doi:10.1038/nrn3313

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual Review of Psychology, 62*, 583-619. doi:10.1146/annurev.psych.093008.100356

Dishion, T. J., & McMahon, R. J. (1998). Parental monitoring and the prevention of child and adolescent problem behavior: A conceptual and empirical formulation. *Clinical Child and Family Psychology Review, 1*, 61-75. doi:10.1023/A:1021800432380

Eisenberg, N., Hofer, C., & Vaughan, J. (2007). Effortful control and its socioemotional consequences. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 287-306) New York: Guilford.

Ferraro, F. R., Holfeld, B., Frankl, S., Frye, N., & Halvorson, N. (2015). Texting/iPod dependence, executive function and sleep quality in college students. *Computers in Human Behavior, 49*, 44-49. doi:10.1016/j.chb.2015.02.043

Fox, A. B., Rosen, J., & Crawford, M. (2009). Distractions, distractions: Does instant messaging affect college students' performance on a concurrent reading comprehension task?. *CyberPsychology & Behavior, 12*, 51-53. doi:10.1089/cpb.2008.0107

Galambos, N. L., Howard, A. L., & Maggs, J. L. (2011). Rise and fall of sleep quantity and quality with student experiences across the first year of university. *Journal of Research on Adolescence, 21*, 342-349. doi:10.1111/j.1532-7795.2010.00679

Gruber, R., Cassoff, J., Frenette, S., Wiebe, S., & Carrier, J. (2012). Impact of sleep extension and restriction on children's emotional lability and impulsivity. *Pediatrics, 130*, e1155-e1161. doi:10.1542/peds.2012-0564

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods, 20*, 102-116. doi:10.1037/a0038889

Hankin, B. L., Wetter, E. K., & Flory, K. (2012). Appetitive motivation and negative emotion reactivity among remitted depressed youth. *Journal of Clinical Child & Adolescent Psychology, 41*, 611-620. doi:10.1080/15374416.2012.710162

d

Hepp, A., Hjarvard, S., & Lundby, K. (2015). Mediatization: Theorizing the interplay between media, culture and society. *Media, Culture & Society, 37,* 314-324. doi:10.1177/0163443715573835

Hofmann, W., Baumeister, R. F., Förster, G., & Vohs, K. D. (2012). Everyday temptations: An experience sampling study of desire, conflict, and self-control. *Journal of Personality and Social Psychology, 102,* 1318. doi:10.1177/0956797612437426

Hofmann, W., & Kotabe, H. (2012). A general model of preventive and interventive self-control. *Social and Personality Psychology Compass, 6,* 707-722. doi:10.1111/j.1751-9004.2012.00461.x

Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers & Education, 59,* 505-514. doi:10.1016/j.compedu.2011.12.023

Kazakova, S., Cauberghe, V., Pandelaere, M., & de Pelsmacker, P. (2015). Can't see the forest for the trees? The effect of media multitasking on cognitive processing style. *Media Psychology, 18,* 425-450. doi:10.1080/15213269.2015.1006789

Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication, 50,* 46-70. doi:10.1111/j.1460-2466.2000.tb02833.x

Lang, A. (2006). Using the limited capacity model of motivated mediated message processing to design effective cancer communication messages. *Journal of Communication, 56,* S57-S80. doi:10.1111/j.1460-2466.2006.00283.x

LaRose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated Internet usage: Addiction, habit, or deficient self-regulation? *Media Psychology, 5,* 225-253. doi:10.1207/S1532785XMEP0503_01

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality, 1,* 141-169. doi:10.1002/per.2410010304

Mark, G., Wang, Y., & Niiya, M. (2014). Stress and multitasking in everyday college life: An empirical study of online activity. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems,* Toronto, Canada. 41-50. doi:10.1145/2556288.2557361

Mark, G., Wang, Y., Niiya, M., & Reich, S. (2016). Sleep debt in student life: Online attention focus, Facebook, and mood. *Proceedings of the 2016 CHI Conference*

on *Human Factors in Computing Systems*, San Jose, CA, USA. 5517-5528. doi:10.1145/2858036.2858437

McDaniel, B. T., & Coyne, S. M. (2016). "Technoference": The interference of technology in couple relationships and implications for women's personal and relational well-being. *Psychology of Popular Media Culture, 5*, 85-98. doi:10.1037/ppm0000065

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences, 106*, 15583-15587. doi:10.1073/pnas.0903620106

Polderman, T. J., Boomsma, D., Bartels, M., Verhulst, F., & Huizink, A. (2010). A systematic review of prospective studies on attention problems and academic achievement. *Acta Psychiatrica Scandinavica, 122*, 271-284. doi:10.1111/j.1600-0447.2010.01568.x

Pool, M. M., van der Voort, T. H., Beentjes, J. W., & Koolstra, C. M. (2000). Background television as an inhibitor of performance on easy and difficult homework assignments. *Communication Research, 27*, 293-326.doi:10.1177/009365000027003002

Pea, R., Nass, C., Meheula, L., Rance, M., Kumar, A., Bamford, H., . . . Yang, S. (2012). Media use, face-to-face communication, media multitasking, and social well-being among 8-to 12-year-old girls. *Developmental Psychology, 48*, 327-336. doi:10.1037/a0027030

Reinecke, L., Vorderer, P., & Knop, K. (2014). Entertainment 2.0? The role of intrinsic and extrinsic need satisfaction for the enjoyment of Facebook use. *Journal of Communication, 64*, 417-438. doi:10.1111/jcom.12099

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: a systematic review and meta-analysis. *Psychological bulletin, 138*, 353-387. doi:10.1037/a0026838

Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior, 29*, 948-958. doi:10.1016/j.chb.2012.12.001

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. doi:10.1371/journal.pone.0054402

d

Shochat, T., Cohen-Zion, M., & Tzischinsky, O. (2014). Functional consequences of inadequate sleep in adolescents: A systematic review. *Sleep Medicine Reviews, 18*, 75-87. doi:10.1016/j.smrv.2013.03.005

Slater, M. D. (2015). Reinforcing spirals model: Conceptualizing the relationship between media content exposure and the development and maintenance of attitudes. *Media Psychology, 18*, 370-395. doi:10.1080/15213269.2014.897236

Vaala, S. E., & Bleakley, A. (2015). Monitoring, mediating, and modeling: Parental influence on adolescent computer and Internet use in the United States. *Journal of Children and Media, 9*, 40-57. doi:10.1080/17482798.2015.997103

Valkenburg, P. M., & Peter, J. (2011). Online communication among adolescents: An integrated model of its attraction, opportunities, and risks. *Journal of Adolescent Health, 48*, 121-127. doi:10.1016/j.jadohealth.2010.08.020

Valkenburg, P. M., & Peter, J. (2013). The differential susceptibility to media effects model. *Journal of Communication, 63*, 221-243. doi:10.1111/jcom.12024

Valkenburg, P. M., Piotrowski, J. T., Hermanns, J., & Leeuw, R. (2013). Developing and validating the perceived parental media mediation scale: A self-determination perspective. *Human Communication Research, 39*, 445-469. doi:10.1111/hcre.12010

Voelkle, M. C., Oud, J. H., Davidov, E., & Schmidt, P. (2012). An SEM approach to continuous time modeling of panel data: Relating authoritarianism and anomia. *Psychological methods, 17*, 176-192. doi:10.1037/a0027543

Voorveld, H. A., & van der Groot, M. (2013). Age differences in media multitasking: A diary study. *Journal of Broadcasting & Electronic Media, 57*, 392-408. doi:10.1080/08838 151.2013.816709

Wallis, C. (2006, March). The multitasking generation. *Time Magazine.* Retrieved from http://www.time.com/time/magazine/article/0,9171,1174696,00.html

Wei, F. Y. F., Wang, Y. K., & Klausner, M. (2012). Rethinking college students' self-regulation and sustained attention: Does text messaging during class influence cognitive learning? *Communication Education, 61*, 185-204. doi:10.1080/03634523.2012.6 72755

Wiklund, M., Malmgren-Olsson, E. B., Öhman, A., Bergström, E., & Fjellman-Wiklund, A. (2012). Subjective health complaints in older adolescents are related to perceived stress, anxiety and gender–a cross-sectional school study in Northern Sweden. *BMC Public Health, 12*, 993. doi:10.1186/1471-2458-12-993

Yang, X., & Zhu, L. (2016). Predictors of media multitasking in Chinese adolescents. *International Journal of Psychology, 51*, 430-438. doi:10.1002/ijop.12187

Zhang, W. (2015). Learning variables, in-class laptop multitasking and academic performance: A path analysis. *Computers & Education, 81*, 82-88. doi:10.1016/j.compedu.2014.09.012

d