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The role of media entertainment in children's and adolescents' ADHD-related behaviors: A reason for concern?

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General discussion

With the growing concern that entertainment media may elicit ADHD-related behaviors, it is critical that empirical research works to separate the fact from fiction accompanying this concern. Although studies on this topic have accumulated, the existing body of literature has not yet resulted in a clear image of how media and ADHD-related behaviors are associated. The objective of this dissertation was therefore to provide a detailed understanding of the role of entertainment media use in ADHD-related behaviors in children and adolescents. Guided by the Differential Susceptibility to Media effects Model (DSMM, Valkenburg & Peter, 2013a), this dissertation had three aims: (1) describing which media use behaviors are associated with ADHD-related behaviors, (2) investigating the role of individual difference factors in this association, and (3) examining causality in this relationship. In doing so, this dissertation extends existing theory and empirical knowledge into media use and ADHD-related behaviors. In short, although relationships were modest, the findings of this dissertation indicate that specifically children's consumption of violent media is of concern, as this can act both as a cause and as a consequence of ADHD-related behaviors. Moreover, in explaining why certain children use more violent media than others, both genetic disposition and parental mediation strategies were found to play an important role. In what follows, the main findings of this dissertation and its implications are discussed, as well as several important directions for future research.

Describing Differences in Media Use Behaviors Associated with ADHD-Related Behaviors

Previous empirical studies into the relationship between media use and ADHD-related behaviors have yielded mixed findings (Kirkorian, Wartella, & Anderson, 2008): while some did find a link between media use and ADHD-related behaviors, other studies have rejected this finding. As such, it is unclear from previous literature whether or not media use and ADHD-related behaviors are associated and if so, whether this is specific to certain content or respondent samples. Therefore, Chapter 1 aimed to integrate and summarize the findings of the existing literature by means of a meta-analysis of 45 empirical studies into the media-ADHD relationship. Although relationships were small (r 's around .12), this meta-analysis showed that increased ADHD-related behaviors were associated with higher media use in general as well as with higher violent media use specifically. Moreover, the results show that study effects sizes increased as the percentage of boys in the sample increased, suggesting a stronger relationship between media use and ADHD-related behaviors for boys than for girls. Besides confirming the expectation that media use and ADHD-related behaviors are associated, Chapter 1 also demonstrated several important gaps in the current literature. For one thing,

it shows that the previous literature has mainly focused on children's general amount of media use or their violent media use. Few studies have examined children's use of other media content, such as educational content. Moreover, as the main focus of current literature has been on media exposure, little is known about potential differences in children's responses to media, such as their level of attention and arousal when using media.

Chapter 2 of this dissertation sought to address the aforementioned gaps in the literature by means of a comprehensive television diary study among 3-7 year-olds. The television diaries were used to measure general television use, specific content use (i.e., violent/scary and educational television content), and children's arousal and attention when watching television. In line with the meta-analysis, high ADHD-related behaviors were associated with more television viewing in general, and more viewing of violent/scary content, but only in boys. There were no differences in the amount of educational content viewing. However, children with high ADHD-related behaviors were less attentive when viewing educational content than children with low ADHD-related behaviors. This attention difference was not found when children watched violent/scary content. Lastly, high ADHD-related behaviors were associated with more arousal when viewing television, regardless of the content. Thus, next to replicating the earlier found differences in media use, Chapter 2 shows that ADHD-related behaviors are also associated with differences in attention and arousal when using media. Most importantly, the findings suggest that although educational content is specifically designed to grab and hold attention, these efforts may be less effective for children with high ADHD-related behaviors. Consequently, children with high ADHD-related behaviors may benefit less from educational content compared to their peers. This is worrisome given that these children often experience educational difficulties. For producers of educational content it may be important to think about how to design content that can also hold the attention children with high ADHD-related behaviors. Interestingly, these children were as attentive as their peers when viewing violent/scary content, which may indicate that these children are able to remain focused if the content is arousing. This, coupled with the finding that ADHD-related behaviors were associated with higher arousal when viewing television, provides some suggestion that arousal might play an underlying role in the media-ADHD relationship.

Individual Susceptibility in the Relationship Between Media Use and ADHD-Related Behaviors

Another gap in the current literature that was identified in the meta-

analysis is that earlier research has mainly focused on the relationship between media use and ADHD-related behaviors in isolation, without taking the child's individual characteristics and social context into consideration. Yet, the DSMM posits that media use and media effects are not universal. Instead, it argues that individual differences can predict media use and can influence the strength of the relationship between media use and behavior. This dissertation explored several potential individual susceptibility factors. In Chapter 3, the role of genetic variability in the violent media-ADHD relationship was investigated. Specifically, this study focused on a gene variant which has been frequently associated with ADHD-related behaviors (the 5-HTTLPR polymorphism, Manor et al., 2001; Zoroğlu et al., 2002). It was found that variability in the 5-HTTLPR gene variant explained differences in children's amount of violent media use. In other words, children with a certain variation of this gene (the "long" variant) consumed a greater amount of violent media than children with a different variation (the "short" variant). Violent media use, in turn, was related to more ADHD-related behaviors. As such, this study shows that the 5-HTTLPR gene variant, which has previously been directly related to ADHD, also indirectly relates to children's ADHD-related behaviors via its relationship with violent media use. Although hypothesized in the DSMM, genetic variability did not strengthen nor weaken the violent media-ADHD relationship. In short, these findings indicate that children are not universally attracted to violent media use, but that this is in part genetically determined.

Where Chapter 3 investigated the influence of child characteristics in the violent media-ADHD relationship, Chapter 4 focused on a social context factor. Specifically, it examined the role of parental media mediation strategies, that is, how parents handle their child's media use. A distinction was made between different styles of *restrictive* mediation (i.e., how parents set rules about media use) and different styles of *active* mediation (i.e., how parents criticize violent content). For the restrictive mediation styles, their direct relationship with violent media use was investigated, and their indirect relationship with ADHD-related behaviors via violent media use. The findings indicate that parents, by the way they set rules about media use, can play a meaningful role in adolescent's amount of violent media consumption, and therefore, in their ADHD-related behaviors as well. Specifically, when parents set rules in an autonomy-supportive way (i.e., while being considerate of the child's perspective), adolescent consumed less violent media, whereas inconsistent rule-setting (i.e., not being persistent on these rules) was associated with more violent media use. Autonomy-supportive restrictive mediation thus seems effective, whereas inconsistent restrictions seems ineffective in regulating adolescents' violent media use. Further, this study examined whether active mediation styles moderated the relationship between

violent media use and ADHD-related behaviors. This was not the case: whether and how parents criticized violent content did not strengthen nor weaken this association. This was unexpected, given findings in earlier studies showing that active mediation can reduce the negative impact of violent media content (e.g., Nathanson, 2004). However, the null finding for active mediation in this study may actually fit well with the hypothesis that violent media use and ADHD-related behaviors are linked through arousal responses to media violence, which may be difficult to influence by parent's critique about the content.

Another individual difference factor that was examined throughout several studies in this dissertation is children's gender. In studies on the relationship between media and ADHD, gender is often included as a control variable since boys typically use more media in general and particularly more violent content (Valkenburg & Janssen, 1999) and display more ADHD-related behaviors (Willcutt, 2012). However, the meta-analysis discussed in Chapter 1 suggested that gender may also serve as a moderator, such that the relationship between media and ADHD-related behaviors would be stronger for boys than for girls. A moderation effect of gender was therefore directly investigated in Chapters 2 and 5. Chapter 2 indeed suggests that the positive relationship between ADHD-related behaviors and general and violent media use may especially exist in boys. However, no gender difference was found in the longitudinal study described in Chapter 5. One reason for this inconsistency in findings may have to do with sample differences. Chapter 2 was conducted among children in early childhood whereas Chapter 5 reports on an adolescent sample. Potentially, gender differences may emerge among children, but may disappear in adolescence. Although it is too early to draw conclusion about the role of gender in the media-ADHD relationship, the studies in this dissertation show that it is important to consider the possibility that the link between media use and ADHD-related behaviors may work differently for boys and girls.

Longitudinal Relationships Between Media Use and ADHD-Related Behaviors

A final gap in the current literature, identified in Chapter 1, is that little is known about reciprocity in the media-ADHD relationship. Most longitudinal studies on the media-ADHD relationship have been conducted from a media effects perspective, focusing on the effect of media on behavior. However, the DSMM, as well as the reinforcing spirals model (Slater, 2007), posits that media use does not only influence behavior, but that behavior also influences media use itself (i.e., media selection). Therefore, by means of a three-wave cross-lagged study, Chapter 5 examined the longitudinal relationship between general and violent media use and ADHD-related behaviors. In general, this study confirmed

the cross-sectional correlations between (violent) media use and ADHD-related behaviors as found in Chapters 1 through 4. However, this study also showed that the longitudinal relationships were dependent on the content and the type of media use. Specifically, it was found that violent media use (television and games) can elicit ADHD-related behaviors among adolescents, and that ADHD-related behaviors, in turn, can predict violent media use. Adolescents' general media use (irrespective of content) did not predict subsequent ADHD-related behaviors. However, high ADHD-related behaviors did lead to increased media use, which could be attributed to increased gaming. The findings in this chapter support both the media effects and the media selection view on violent media use and ADHD-related behaviors. Thus, violent media may act both as a cause and as a consequence of ADHD-related behaviors, which suggests a negative cycle of effects between the two. General media use, specifically gaming, was only found to be a consequence of ADHD-related behaviors. These findings lend support to the argument that media effects on ADHD-related behaviors cannot be considered in isolation from media selection processes. Moreover, these results highlight that media use is not a unidimensional construct. Instead, they show that there are important content and medium differences in the relationship between media use and ADHD-related behaviors. The finding that only violent content (and not media use in general) elicited ADHD-related behaviors may be due to violent media content being especially arousing. Further, the findings suggest that children with high ADHD-related behaviors may be especially drawn to gaming rather than television viewing. Again, arousal may be driving this difference. Games are typically more active and interactive than television programs or movies and may therefore elicit more arousal. This may make it particularly attractive for children with high ADHD-related behaviors. The content and medium differences found in this chapter indicate that, when examining the role of media use in ADHD-related behaviors, careful consideration should be given as to how media use is conceptualized.

Putting the Pieces Together

The three main conclusions that can be drawn from this dissertation are graphically represented in Figure 1. First, in general, all studies support the hypothesis that children's and adolescents' ADHD-related behaviors are associated with their media use, particularly their violent media use. Second, the findings suggest that violent media use is influenced by children's genetic variability and parent's restrictive media mediation styles. Third, there seems to be a reciprocal relationship between violent media use and ADHD-related behaviors.

Importantly, the five studies underline that the relationship between media use and ADHD-related behaviors is far more nuanced than what popular news headlines may suggest. For one thing, only violent media use (and not media use in general) predicted subsequent ADHD-related behaviors. Particularly noteworthy in this context is that the average amount of violent media use was not very high throughout the studies in this dissertation. This, however, may be specific to the Netherlands, the country in which the data was collected. Still, although the majority of children use little violent media, the small group of children who do consume a lot of violent media are of particular concern. Another nuancing factor is that effect sizes were small throughout the studies, which may indicate that the violent media-ADHD relationship mainly exists in certain vulnerable children, but may be negligible for the majority of children (Valkenburg & Peter, 2013b). For example, children who are already at risk for developing ADHD-related behaviors may be especially vulnerable to violent media effects on these behaviors. Common risk factors to consider in this, besides genetic disposition, are prenatal smoking, prematurity, and adverse family environments (Tarver, Daley, & Sayal, 2014). Thus, although parents should keep an eye on their children's violent media use, the results of this dissertation only partly justify the public concerns that are so often discussed in the popular press.

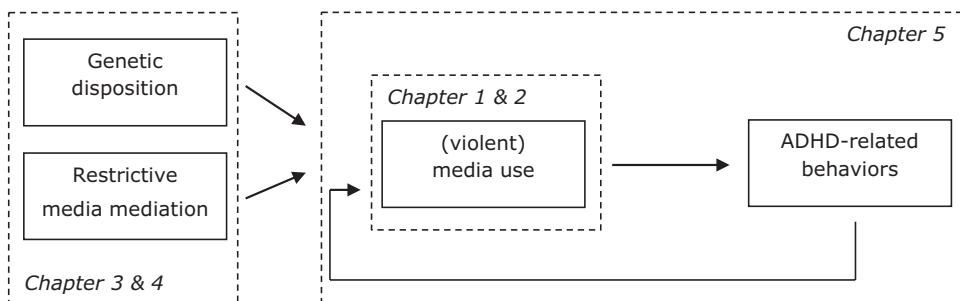


Figure 1 Overview of main findings.

Where To Go From Here?

Besides providing a detailed understanding of the relationship between media use and ADHD-related behaviors, this dissertation highlights several important avenues for future research. First, throughout the studies in this dissertation, it was hypothesized that arousal was the central underlying mechanism in the media-ADHD relationship. Arousal functioning was used to explain both why (violent) media use can elicit ADHD-related behaviors, and why children

with higher ADHD-related behaviors use more (violent) media. Although the findings of several chapters in this dissertation do suggest that arousal may be involved, no study to date has directly examined whether and how it mediates the longitudinal relationship between media use and ADHD-related behaviors. This calls for future research examining the underlying role of arousal in this association. This is not an easy task, for it may be difficult to measure children's arousal levels in real-life longitudinal designs. Arousal responses to media have been successfully measured in lab settings using physiological measures such as skin-conductance or heart-rate measures (Ballard & Wiest, 1996; Barlett, Harris, & Bruey, 2008; Barlett & Rodeheffer, 2009). To my knowledge, this has not been done yet while also including measures of ADHD-related behaviors, which would be a good place to start. However, the ecological validity of such lab studies is low and results may therefore not easily translate to real-life settings. This opts for analyzing arousal in real-life settings as well, for example using survey measures or observational measures. A potential shortcoming of such measures is that they may actually capture the behavioral manifestations of arousal instead of the child's internal arousal level. For example, low baseline arousal level may lead to restless behavior, in which case the reporter may indicate that the child's arousal level is high instead of low. Thus in future research examining the role of arousal in the media-ADHD relationship, a combined approach should be taken, employing several different measures of arousal in one longitudinal study.

Second, future studies are needed to disentangle the specific features of media that explain how media use can elicit ADHD-related behaviors and why certain content or medium types are especially attractive for children who display high ADHD-related behaviors. For example, if violent content is related to ADHD-related behaviors through the arousal elicited by the content, it is yet unclear whether the arousal-inducing effect can be attributed to the exciting narrative itself, its fast pace, or its frequent use of formal features. Further, the longitudinal study described in Chapter 5 showed that ADHD-related behaviors only affected overall gaming and not overall television viewing, which was argued to result from differences in interactivity and activity between these two media types, and hence in the level of arousal each elicits. However, activity and interactivity, as well as arousal level, were not directly measured. Although experimental studies suggest that playing a game elicits more arousal than watching television (Calvert & Tan, 1994; Lin, 2013), this has yet to be studied in the relationship with ADHD-related behaviors. These examples call for future studies that closely examine how and why specific media content and medium types are related to ADHD-related behaviors. Besides the aforementioned role of narrative, pacing, formal features, and (inter)activity, another potentially interesting factor in this is the

level of immersion (i.e., how much one feels physically present in the virtual world). Especially with the onset of new techniques such as 3D, immersion in television programs, movies, or games may be higher as ever, which is likely to influence the arousal that is elicited.

Third, further research is needed into other social context factors (i.e., besides parental media mediation) that may play a role in the relationship between media use and ADHD-related behaviors. After all, media use and ADHD-related behaviors do not occur in a vacuum. Instead, children grow up within a family and within a peer group, who are likely to influence children's media use, their behavior, or the relationship between media use and behavior (Valkenburg & Peter, 2013b). Family factors that are of potential interest are the media use of parents themselves and parent behavioral problems (e.g., parents' own ADHD-related behaviors), as these factors may provide particular norms, rules, and examples towards media use and behavior. In this respect, the media use of peers and their norms towards certain content or behaviors may also play an important role, especially for adolescents, who increasingly value the opinions of their peers. Another reason to focus on family and peer influences in future research is that such factors have been put forward as potential explanatory mechanisms in the media-ADHD relationship. For example, poor peer relationships and frequent parent-child conflict have both been argued to explain why children with high ADHD-related behaviors use more media in general (Acevedo-Polakovich, Lorch, & Milich, 2007).

Finally, more extensive longitudinal research is needed. The longitudinal study described in Chapter 5 only included three data waves, and exclusively focused on pre- and early adolescents. Although the five studies of this dissertation were conducted among samples of different age ranges, and consistently showed a relationship between media use and ADHD-related behaviors, the question remains how this relationship develops over the life course. More extensive longitudinal studies, including more data points and larger age ranges, could give more insight into this. Moreover, it could provide replication of and more details about the reciprocity between violent media use and ADHD-related behaviors. For example, studies could examine when the negative cycle between violent media use and ADHD-related behaviors starts and to what age it continues. Finally, such studies could shed more light on potential gender differences. As noted, there were inconsistencies between the different studies as to whether or not gender influences the media-ADHD relationship, which were attributed to differences in the ages of the samples, but this could not be directly assessed.

Implications for Parents and Healthcare Professionals

The findings of this dissertation offer important practical implications for

parents and healthcare professionals. Although effect sizes were small, the chapters repeatedly show that there is a relationship between violent media use and ADHD-related behaviors, which was consistent over different samples (i.e., early and middle childhood and adolescence) and over time. The role of violent media use should therefore be considered in future ADHD prevention and treatment programs, especially because media is omnipresent in children's lives and takes up a large amount of their leisure time. Specifically, parents should be made aware of the potential effects of heavy violent media use on certain children's behavior. Further, parents may be stimulated to regulate their child's violent media use. The findings of this dissertation indicate that this may help to prevent ADHD-related behaviors or, if these behaviors are already present, that it may curtail the negative cycle between violent media use and ADHD-related behaviors. Specifically, parents can be instructed to consult media content ratings systems in order to obtain information about the content and the age-appropriateness of media productions. Examples are the Dutch 'Kijkwijzer' system, which provides ratings of television programs and movies, and the European 'PEGI' system providing game ratings. Both of these systems indicate whether or not certain productions contain violent content, and below which age the content may be harmful to the child. Rating systems like these are easy to use tools for parents to identify which content is more or less appropriate for their children. Guided by these rating systems, parents can be advised to set rules prohibiting their child from watching certain television productions or playing certain games. However, as indicated by the findings of this dissertation, it is important that parents are instructed to set these rules in an autonomy-supportive way, at least for adolescents. For example, for these rules to be effective, parents should explain why they set these rules and should ask about their teen's view on the matter, and show that they take their teen's opinion seriously. Healthcare professionals can play an important role in advising parents about potential harmful effects of heavy violent media use and about ways to regulate this use. Further, healthcare professionals may incorporate media use measures in their assessments of children displaying ADHD-related behaviors in order to evaluate whether violent media use is a factor that deserves attention in the treatment of these behaviors.

To Conclude

The findings of this dissertation demonstrate that media use can, in fact, play a role in children's and adolescents' ADHD-related behaviors. However, they also highlight that this relationship should be considered with nuance because not all media content elicits ADHD-related behaviors. In particular, parents and healthcare professionals should be made aware of the potential harmful effects

of violent content. Since effect sizes were small, researchers should attempt to discover individual susceptibility factors that explain differences in media use and media effects on children's behavior. In doing so, children who are at particular risk for developing ADHD-related behaviors in response to (violent) media use may be identified early in the future. Together, the findings of this dissertation form an important step in unraveling the complex interplay between media use and ADHD-related behaviors.

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