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ABCs or Attack-Boom-Crash? A longitudinal analysis of associations between media content and the development of problematic media use in early childhood

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Abstract

Researchers have begun to extensively examine pathological (or addictive-like) media use during adolescence and adulthood. However, few studies have examined precursors to these types of behavior (termed problematic media use) in early childhood, with even fewer examining predictors of this behavior over time. The current longitudinal study examined bi-directional associations between television content (educational, prosocial, and violence) and problematic media use over a 1-year period during early childhood. Participants included 443 children (*M* age at Wave 1 = 29.68 months) and their parents. Results revealed that early educational media was protective against developing problematic media use over time. However, early problematic media use was not predictive of future media content choices longitudinally. Additionally, problematic media use was moderately stable over time. Implications for parents and policy makers regarding the importance of early media content for later outcomes and consideration of media use trajectories are discussed.

Keywords

Problematic media; early childhood; television; addiction; educational media; longitudinal

Today's parents face the unprecedented challenge of raising healthy digital media consumers in a media-saturated world. While estimates vary, the consensus is that children under two years spend roughly one hour a day on personal screens (i.e., smartphones or tablets; Rideout & Robb, 2020), while children between two and eight spend roughly two hours a day (Radesky et al., 2020; Rideout & Robb, 2020), with many children spending even higher amounts of time using screen media (e.g., Guzmán, et al., 2022; Martin et al., 2022; Raj, et al., 2022). These numbers, however, are often based on parent reports and do not include

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Data, analytic methods, and study materials can be accessed by contacting the first author

time children spend on media in settings away from their parents (e.g., childcare; Christakis, 2009), meaning that young children may spend even more time on media than reported. As high as these numbers may seem, it is important to remember that young children use media for various reasons, and the impact of media use on children's development differs significantly based on the content and context of the media use (Barr & Linebarger, 2017). For example, young children's media use to facilitate connection and relationships via video chatting (e.g., FaceTime and Zoom) can foster healthy social-emotional development (e.g., McClure & Barr, 2017; Strouse et al., 2021). Alternatively, using media to regulate child emotions is related to unhealthy media strategies during childhood (Coyne et al., 2021). One of the most frequent contexts that young children (2–3 years old) specifically use media is to watch television or other prerecorded videos via streaming services, such as YouTube (Neumann & Herodotou, 2020; Rideout & Robb, 2020).

Research indicates that rather than the overall amount of media exposure, the media content is a better predictor of different developmental outcomes (e.g., educational attainment, language development, prosocial behavior, aggression) (e.g., Coyne et al., 2018; Fisch et al., 1999; Tomopoulos et al., 2010; Radeky, et al., 2014; Rasmussen et al., 2016; Wright et al., 2001). However, little research has examined how media content might be related to the development of problematic media use (or early signs of media addiction) during early childhood (Domoff et al., 2020). The purpose of the current study is to examine longitudinal associations between three types of preference for media content (educational, prosocial, and violence) and later problematic media use during early childhood (ages 2–3).

Problematic Media Use

Problematic media use is defined as excessive media use that interferes with overall functioning (Domoff et al., 2020). The construct of problematic media use captures the wide umbrella of maladaptive social, behavioral, and academic development due to excessive or dysfunctional media use. This dysfunction is typified by loss of interest in other activities, preoccupation with media, and deception surrounding media use and content (Domoff et al., 2019).

Typically, research has examined problematic media use in older children and adolescence in the context of gaming or social media (Gentile et al., 2017; Plante et al., 2019). Research indicates that problematic video gaming (also called pathological gaming or internet gaming disorder) is associated with clinically significant impairment in daily psychosocial functioning for the individual (DSM–5; American Psychiatric Association, 2013). It is often related to greater feelings of loneliness, deteriorated social relationships over time (Yu, et al., 2022), and concurrently with other mental health issues in adolescents (e.g., Desai et al., 2010; Stevens et al., 2020). Video games, however, are not necessarily always maladaptive, as simply playing video games for extended periods does not inherently lead to the development of problematic gaming (Király et al., 2017). Specifically, video game content (with violent content being more problematic, e.g., Ivarsson et al., 2013), influences the impact of video games on the development of problematic gaming patterns.

This research, however, has typically examined adolescents and adults. Recently, researchers have also begun to examine problematic media use in young children and infants (Coyne et al., 2021; Domoff et al., 2020) and reported early signs and patterns of problematic media use in infants and toddlers (Domoff et al., 2020). However, this research itself is in its infancy, with little research examining predictors and outcomes of problematic media use in early childhood.

Interactional Theory of Childhood Problematic Media Use

Drawing from Bronfenbrenner and Morris' model of human development (2006), the Interactional Theory of Childhood Problematic Media Use (IT-CPU) posits that three primary components may impact childhood problematic media use: distal factors (context), proximal factors (antecedents to problematic media use such as parent media attitudes) and maintaining factors (processes that reinforce problematic media use; Domoff et al., 2020).

An important distal factor in the IT-CPU framework is the digital environment. The digital environment refers to aspects of the media landscape that are designed to continue media engagement. For example, the Instagram discovery page or recommended videos on YouTube or TikTok promote continued engagement by using algorithms to provide content catered to the current user based on prior user history. If a child watches a Sesame Street video on YouTube, the algorithm suggests another Sesame Street video because the child is more likely to engage with a similar video to what they previously watched than to unrelated content. This is just one example of how the IT-CPU framework theorizes that the digital environment keeps children engaged and contributes to the development of problematic media use.

Media content is another potential aspect of the digital environment that may impact problematic media use in childhood. One way that media content may serve as a distal factor is through the pace of the show. Violent content for children often moves faster than other forms of content (such as educational shows; Fitzpatrick et al., 2012; Zimmerman & Christakis, 2007; Lillard & Peterson, 2011). This quicker pace could be more engaging for children, potentially making it harder for young children to disengage from the media. Thus, violent content could serve as a distal factor that leads to more problematic media use because it is harder for children to stop watching than other content types, which are slower paced.

The IT-CPU framework also posits that maintaining factors (or the processes that reinforce problematic media use) solidify maladaptive media patterns. These maintaining factors could include processes such as media emotion regulation (Coyne et al., 2021). This refers to when parents use media to help children regulate difficult emotions. For example, if a child throws a tantrum in a store, a parent may give the child a mobile device to help them calm down. The consistent use of media in this manner has been positively linked to higher problematic media use in children (Coyne et al., 2021).

Media content may also serve as a maintaining factor through the behaviors that the characters model. Educational and prosocial content often models healthy emotion

regulation strategies (e.g., Daniel Tiger's Neighborhood; Malti & Dys, 2018; Rasmussen et al., 2016), which may be a protective maintaining factor against the development of problematic media use. In contrast, violent content may more often model impulsive actions and maladaptive coping patterns (e.g., punching when angry), which, based on the IT-CPU framework, are maintaining factors that might contribute to later problematic media use.

Types of Content

Based on this theoretical perspective, the content that young children view may significantly impact the development of problematic media use. This paper examines three primary types of content: educational, prosocial, and violent content.

Educational content

The primary goal of educational content is to prepare children for a formal education setting, such as preschool or kindergarten. Educational content is linked to positive academic outcomes for children, including increased vocabulary (e.g., Neuman et al., 2019) and more advanced pre-reading skills (Eutsler, et al, 2020; Vandewater & Bickham, 2004). Additionally, Thakkar et al. (2006) found that educational content for children three years old and older increased imaginativeness and significantly decreased negative racial attitudes in experimental settings. Educational media can also teach social and emotional skills. For example, Rasmussen et al., (2016) found that when parents actively mediated the show *Daniel Tiger's Neighborhood*, children displayed higher levels of empathy and emotion recognition.

Prosocial content

Prosocial media content typically is less focused on school readiness or social/emotional needs and more focused on other behavioral aspects of healthy development. Social cognitive theory (Bussey & Bandura, 1999) suggests that the examples an individual sees in media may impact their behavior by modeling both behaviors and attitudes that the viewer then enacts. Thus, prosocial media content is linked to more prosocial behaviors and adaptive emotional strategies (Coyne et al., 2018). One challenge, however, is that very young children often struggle to follow prosocial dialogues (Mares et al., 2018). The potential complexity of some prosocial content may mitigate the potential positive impact of prosocial content on children.

Violent content

In contrast to educational and prosocial content violent content is empirically linked to many negative outcomes for children. Despite the negative correlates, violent programming is still highly prevalent in children's media. A recent content analysis of primetime television content directed toward children found that 76% of programs contained violence, with almost half of the violence being lethal in nature (Martins & Riddle, 2021). Some researchers have posited that the high prevalence of violence in children's media is due to its universal language and the fact that "it can be more easily produced than complex dialogue-based stories" (Singer & Singer, 2000, pg. 2). For these reasons, violent content could be more accessible for children. The impact of violent content on children and

adolescents has been widely researched; the majority of which finding that violent content is related to negative outcomes, including increased attention problems (e.g., Christakis, 2009), lower academic achievement, and increased emotional distress (e.g., Fitzpatrick et al., 2012).

Current Study

Because of these distinct differences in educational, prosocial, and violent content for children, it is probable that the type of content children watch may influence the development of problematic media use. There is, however, very little research examining problematic media use in early childhood, none to our knowledge examining the impact of any type of media content on the development of problematic media use patterns. We examine these associations in a short-term longitudinal study of 2- to 3-year-old children.

We hypothesize that exposure to violent content in media will be associated with higher levels of problematic media use in early childhood. We also hypothesize that exposure to educational content and positive role models in media depicted in prosocial content will be associated with lower levels of problematic media use in early childhood. Additionally, we will examine bidirectional associations between problematic media use and choice of media content to explore the possibility that early problematic media may be associated with the media content that children subsequently choose to view. Finally, we will examine stability paths for problematic media use and media content.

Methods

Participants

Participants for this study were taken from waves 3 and 4 of Project M.E.D.I.A. (Media Effects on Development from Infancy to Adulthood), an ongoing, longitudinal study of child development in a media saturated world. At time one, 500 primary caregivers participated in this study (97% female). At wave two, 19 additional low-income primary caregiver-infant dyads (household income below $50,000) were recruited for participation in Project M.E.D.I.A. using mailers sent to the participant home through the Colorado Office of Health and Vital Records which identified anyone in the local area who had a child that was over one, but under two for a final total sample of 519 infants (*M* age = 29.68 months). Retention rates from Wave 1 to Wave 3 were 88.93% for primary caregivers. For reader ease, we will refer to the two waves used in the current paper conducted when children were 2 and 3 years of age, as Wave 1 and Wave 2. See Table 1 for demographic variables for the sample.

Measures

Problematic media use.—Parents reported on children's problematic media use using the nine item Problematic Media Use Measure Short Form (PMUM-SF, Domoff et al., 2019). The PMUM was designed to assess multiple domains of media interference, typically associated with addiction or problematic use in children under twelve, including loss of interest in other activities, preoccupation with media, withdrawal, tolerance, deception, and serious problems due to media use. Parents were asked to think about all types of screen media and then to think about how often their child engaged in a series of behaviors during the past month. Items were measured using a five-point Likert-type scale from 1 (*Never*) to 5

(*Always*). Example items include "When my child has had a bad day, screen media seems to be the only thing that helps him/her feel better" and "The amount of time my child wants to use screen media keeps increasing." Items were averaged and higher scores are indicative of increased problematic media use by young children. Reliability was adequate at both waves (Wave 1: $\alpha = .86$; Wave 2: $\alpha = .88$).

Media content.—Participants listed their child's three favorite television programs at both waves. There were a total of 333 television programs mentioned across the two waves. Each program was rated for educational, prosocial (positive messages) or violent content on a 0 (*no content*) to 5 (*high levels of content*) Likert scale. Ratings were obtained using scoring from the media content coding website *Common Sense Media* (2022). According to the website, "each program is subjected to a detailed evaluation process by expert, trained reviewers, who come from every corner of the media, academic, and parenting worlds… [including] teachers, librarians, and experienced academics who've studied the impact of media at length. All are passionate about both media and Common Sense's "sanity, not censorship" approach to providing information and have been extensively trained in our child development-based rating rubric". Common Sense Media rates each program on a number of different constructs (e.g., sex, profanity, rating, materialism), however, we focused on educational, prosocial behavior (positive messages), and violent content as those were hypothesized to be the most related to problematic media use over time. Overall, we were able to rate 237 of the programs listed using the method described above. Missing programs were typically only mentioned by one participant and the majority were not even specific television programs (e.g., *Baby TV shows; Cartoons; Youtube*).

As an example*, Daniel Tiger's Neighborhood, Sesame Street*, and *Octonauts* were all rated as 5s for educational content, *Doc McStuffins, Storybots*, and *Super Wings* were all rated 5s for prosocial content (positive messages), and *Hulk and the Agents of S.M.A.S.H., Spiderman, and Power Rangers* were all rated as 3s or 4s for violence (no show was rated as a 5 for violence in the sample). We requested reliability statistics from the company, but they did not have the formal reliability statistics that are common in this type of research. However, other research using this analytic method reported that the rating system is both valid and reliable (see Coyne & Stockdale, 2020).

Analysis Plan.—We will first present descriptive statistics on the main variables. Then, we will conduct a cross-lag panel model examining bi-directional associations between children's preference for television content (educational, prosocial, and violence) and problematic media symptoms across a one-year period of time. Standardized coefficients will be reported. Data is available upon request from the first author. This study was pre-registered via Open Science (DOI: 10.17605/OSF.IO/S3UN2)

Results

Preliminary Analysis

Bivariate correlations between major variables are presented in Table 2. Table 3 presents means and standard deviations for major variables at each time point. A series of paired samples t-tests revealed that there were significantly higher levels of problematic media, (*t*

= 6.51, $p < .001$), and media violence, ($t = 3.10$, $p = .002$) at Wave 2 than at Wave 1 and significantly higher levels of educational ($t = 4.21$, $p < .001$) and prosocial content ($t = 2.50$, $p = .013$) at Wave 1 than at Wave 2.

Main Analysis

A cross-lag panel analysis was constructed in Mplus v. 8.4. The analysis modelled early television content (educational, prosocial, and violence) predicting later problematic media use and vice-versa while controlling for stability paths for all variables. Child age, parental education, and race were used as control variables as each has been associated with media use in prior research. The model was fully saturated – thus, full fit statistics are not presented. See Figure 1 for the model.

Demographic patterns.—Consistent with past research (e.g., Anderson et al., 2001), higher parental education was associated with higher educational preference scores ($\beta = .14$, $p = .004$) and higher positive messages scores ($\beta = .14$, $p = .003$) on television.

Stability paths.—Problematic media was moderately stable over time ($\beta = .10$, $p < .001$). Additionally, media content was fairly stable for educational ($\beta = .31$, $p < .001$) and prosocial media ($\beta = .22$, $p < .001$), but not for violent content ($\beta = .15$, $p = .11$). Age was associated with viewing more prosocial content on television ($\beta = .10$, $p = .016$).

Predictors of problematic media use.—Overall, a higher preference for viewing educational television content was associated with lower levels of problematic media use one year later ($\beta = -.17$, $p = .013$). However, viewing early prosocial content ($\beta = .06$, $p = .34$) or violence ($\beta = .01$, $p = .99$) on television was not associated with later problematic media use. That is, preference for educational content at age 2 was predictive of lower problematic media scores at age 3. Notably, the r^2 value for problematic media use at Wave 2 was .32, suggesting there are likely existing variables not included in the study that contribute to the development of problematic media use in early childhood.

Test of bidirectional effects.—Early problematic media use was not associated with later educational, ($\beta = -.08$, $p = .11$), prosocial, ($\beta = -.10$, $p = .11$), or violent content, ($\beta = .07$, $p = .25$). That is, problematic media use at age 2 was not predictive of preference for different types of media content at age 3.

Discussion

The current study is the first, to our knowledge, to examine associations between media content and problematic media use longitudinally in children. It is important to note that problematic media use in children remained moderately stable across time, from age two to age three. These findings suggest that when a child uses media in problematic ways at age two, they are likely to continue this pattern one year later. Problematic media use has been associated with negative outcomes across the lifespan (e.g., mental health issues; Desai et al., 2010), with emerging research suggesting that problematic media use in children may disrupt social functioning, school performance, and increase family conflict (Domoff et al., 2020). The current study suggests that problematic media use in children might appear

early in development and may be somewhat stable across early childhood. Our ongoing longitudinal data collection will provide a clearer developmental trajectory of problematic media use.

A preference for early educational content on television at age 2 was negatively associated with problematic media use symptoms at age 3 (while controlling for early problematic media use). We confirmed our hypothesis derived from the IT-CPU theory (Domoff et al., 2020) that early media content might protect against problematic media use over time due to both distal and maintaining factors. In terms of distal factors, educational media tends to be slower paced, which is related to better executive functioning and self-regulation in general (both of which might be protective of problematic media symptoms; Fitzpatrick et al., 2012). Additionally, young children may be better able to disconnect from educational media compared to programs with high stimulation and fast pacing (such as violent content).

Apart from pacing, it is also likely that educational media specifically models behavior that might be protective for the development of problematic media over time. According to IT-CPU theory (Domoff et al., 2020), this represents a maintaining factor, that might be continually protective for young children. For example, *Daniel Tiger's Neighborhood* is one program rated as one of the most educational (and most popular) in our sample. This program specifically models and teaches children important strategies around self-regulation and effortful control and is related to increased self-regulation in early childhood (e.g., Rasmussen et al., 2016). Hypothetically, if a child views this type of program and then is asked to disconnect from media, the child could use the self-regulation skills they learned to effectively transition to the next activity. In addition, they may learn to better regulate their thoughts and emotions, helping to reduce media fixation and when negative feelings about disconnecting from media. Children at this developmental level are just beginning to learn these regulation strategies (Spinrad et al., 2004), however, these strategies appear to be protective for the development of pathological media use at much later ages (Liau, Neo, Gentile, Choo, Sim, Li, & Khoo, 2015). It may be that educational media models effective regulation strategies that then protect against the development of problematic media use throughout development. Future research should continue to examine these associations and mechanisms over time.

Even though educational content was associated with decreased problematic media use, prosocial content was not. This went against hypotheses and was somewhat surprising, as educational and prosocial content were moderately correlated. Prosocial media is defined as media that includes voluntary behavior to help others (e.g., sharing, helping) and may often model empathic responses (Coyne & Smith, 2014). Though prosocial media is associated with positive outcomes for children, such as higher levels of prosocial behavior, empathic concern, and lower levels of aggression (e.g., Coyne et al., 2018), it may not specifically model the strategies that protect against the development of problematic media use (at least compared to educational media). Due to the linguistic complexity that often accompanies prosocial content, higher levels of parental mediation may be necessary to derive regulatory benefits. Future research should examine both the context of media use in terms of patterns of parent-child interaction during media usage as well as the content that is preferred as described here.

Additionally, violent content was not related to problematic media use which did not support the hypothesis. Violent content tends to be more stimulating in nature, has faster pacing, and tends to model impulsivity (as opposed to effortful control or regulation, e.g., Fitzpatrick, et al., 2012). However, very few children viewed violent content at this age, with most programs aimed at an early childhood audience being more educational or prosocial in nature. Research on adolescents suggest that playing violent video games might be a risk factor for the development of pathological gaming (Ivarsson, et al., 2013). Thus, we encourage future researchers to study violent media content and how it might be related to the development of pathological media symptoms beginning with younger children and following their trajectory.

We also found that age was associated with viewing more prosocial content on television. This was expected given that prosocial content containing positive messages is typically more linguistically complex and hence there was increased preference for positive messages in older children. Notably, there was no significant difference between prosocial content viewed between Waves 1 and 2, so this finding is somewhat of a paradox. It may be that slightly older children may view more prosocial behavior on media since parents may feel they are cognitively “ready” for the content at an early age. However, given the high amount of programs that contain prosocial behavior directed toward young children, we may not have noticed a large difference in a year in the sheer amount of this type of content viewed by individual children – particularly if they preferred similar programs over time.

Finally, early problematic media content was not associated with media content one year later. We did not have a specific hypothesis regarding this particular association, but it appears that content tends to drive the relationship between media and problematic use as opposed to the converse (at least during early childhood). Again, the bidirectionality of these two factors will be important to examine over development, especially as children seek out a wider variability of media content.

There are significant implications of these findings for parents of young children. Problematic media use tends to be somewhat stable over time, even from 2 to 3 years of age, suggesting that these behaviors and patterns start quite early in life (and thus have the potential to be modified at an early age). Tools and resources could be developed for parents to educate them about patterns of problematic media use so that they can intervene. It is encouraging that the guidelines provided by the AAP (Reid et al., 2016) to choose educational media content may act as a protective measure against problematic media use – though more research is needed before causality can be determined. Although additional research is needed, prior research has demonstrated that parental mediation where parents discuss media themes with their children might magnify the protective impact of educational media (e.g., Dore et al., 2021; Rasmussen et al., 2016;).

This study is not without limitations. Notably, we only examined children’s top three favorite television programs as opposed to examining their entire media diet (which is methodologically far more difficult). Thus, children are likely exposed to other media not captured in the current study, though at lower levels than their favorite programs. Examining favorite programs is a common and valid technique used in media research (e.g., Busching

et al., 2013), however, future research should consider capturing all types of media use. Additionally, we only focused on television programs in the current study. Many children use other types of media (e.g., apps, music, books) with diverse content that may be risky or may protect against the development of problematic media use over time. We encourage research that examines all types of media use in order to holistically understand problematic media use in childhood. Finally, we cannot rule out the possibility that there is a third variable (e.g., time spent with parents, parent/child relationship, mental health of the parent or child) that may be causing the relative decreases in problematic media use that are associated with early educational media consumption. Thus, we hope future research continues to examine the mechanisms behind these potential associations.

In sum, we found that problematic media use in early childhood is moderately stable and early educational media use (at age 2) was associated with lower levels of problematic media use one year later (at age 3). Media use among children is nearly ubiquitous in today's modern world, and parents have many options for their children's media content. We encourage parents to increase the amount of educational content they show their children to protect against problematic media use. Parents should also become more aware of their child's media use as they help them to become well-adjusted digital natives.

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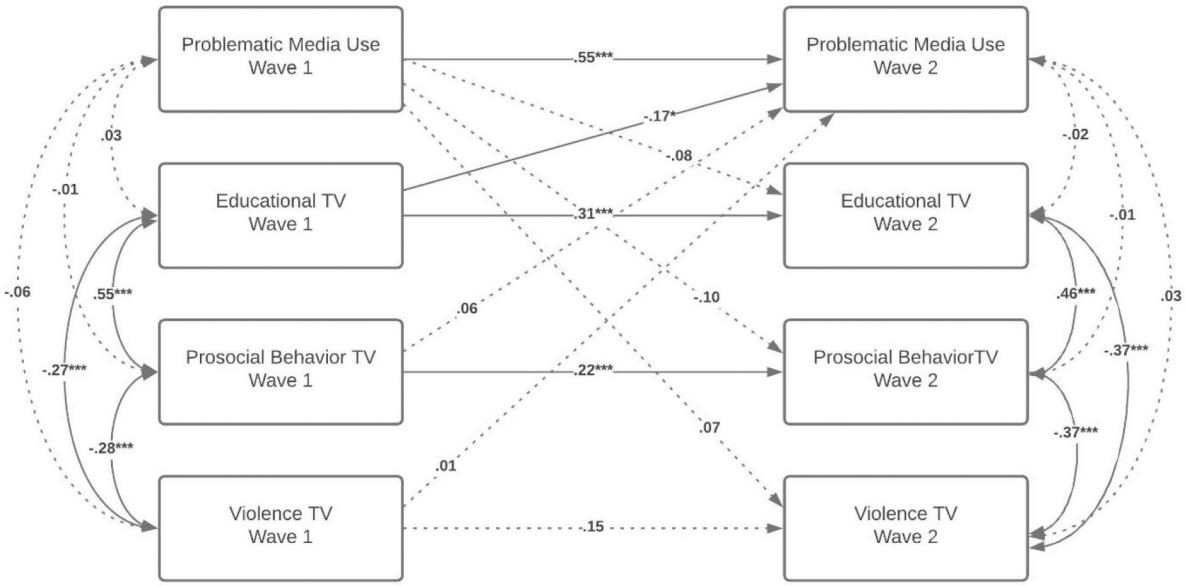

Figure 1:

Cross-lag panel model of media content and problematic media use

Notes: Standardized values are shown. Additionally, error terms for endogenous variables and covariances are not shown. Covariates (child age, parental education, race) are not shown in the model for parsimony. All additional statistics can be obtained by contacting the author directly. *$p < .05$; **$p < .01$, ***$p < .001$

Table 1

Demographic Statistics

	%
Caregiver Marital Status	
Married	66.30
Single-Never married	8.70
Unmarried- Living with partner	9.0
Divorced, Separated, or Widowed	2.80
Caregiver Education	
High school (or equivalent) or less	11.00
Some college or vocational degree	26.70
Bachelor's degree	30.00
Graduate degree	19.30
Combined Household Income	
Less than $20,000	8.30
Between $20,000 and $50,000	21.80
Between $50,000 and $80,000	27.20
Between $80,000 and $100,000	12.50
Above $100,000	30.20
Public Assistance	
Currently (at the time of data collection)	25.90
In the past year, but not currently	5.00
In the past, but not in the last year	18.80
Have never received public assistance	50.20
Ethnicity	
Latinx	21.00
Not Latinx	79.00
Race	
White	67.00
Black	6.30
Asian American	2.40
American Indian/Alaskan Native	0.70
Multi-racial	4.20
Other	19.30

Table 2:

Bivariate correlations between major variables

Variables	1	2	3	4	5	6	7	8
1. Problematic media use W1	--							
2. Problematic media use W2	.55**	--						
3. Educational TV W1	.03	−.11*	--					
4. Prosocial TV W1	−.00	−.03	.55**	--				
5. Violent TV W1	−.06	−.06	−.28**	−.28**	--			
6. Educational TV W2	−.09	−.07	.31**	.27**	−.16**	--		
7. Prosocial TV W2	−.09	−.08	.16**	.25	−.06	49**	--	
8. Violent TV W2	.05	.07	−.09	−.02	.14*	−.38**	−.37**	--

Note: $p<.01$**, $p<.05$*

Table 3:

Means and standard deviations of major variables by wave

	Wave 1			Wave 2		
Variable	**Mean**	**SD**	**Range**	**Mean**	**SD**	**Range**
Problematic media use	1.7008	.56137	1.00–3.67	1.9120	.61823	1.00–4.22
Educational TV	2.6613	1.41854	.00–5.00	2.3288	1.23076	.00–5.00
Prosocial TV	3.8582	.76549	.00–5.00	3.7446	.77225	.00–5.00
Violent TV	.2598	.57791	.00–4.00	.4005	.65763	.00–4.00