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# Parental perceptions of technology and technology-focused parenting: Associations with youth screen time

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ABSTRACT

In the present study we propose a model linking parental perceptions of technology to technology-related parenting strategies to youth screen time, and, finally, to internalizing and externalizing problem behaviors. Participants were 615 parents drawn from three community samples of families with children across three developmental stages: young childhood, middle childhood, and adolescence. The model was tested at each stage with the strongest support emerging in the young childhood sample. One component of parental perceptions of technology, perceived efficacy, was related to technology-related parenting strategies across developmental stages. However, the association of these strategies to child screen time and, in turn, problem behaviors, diminished as children increased in age. Implications for intervention are considered.



In only a few years, the use of mobile technology (e.g., smartphones, tablets, e-readers) in the United States has changed dramatically. Recent reports from the Pew Research Center found that 58% of Americans own a smartphone (Pew Research Center, 2014). Tablet use especially is increasing, as the number of households with a tablet device rose 39% between 2010 and 2014 (Pew Research Center, 2014). Parents in particular appear to be adopting these new forms of technology at a rapid pace; among parents with a minor living in the home, tablet ownership has increased from 26% in 2012 to 50% in 2013 (Zickuhr, 2013a). Despite the increasing adoption rates of mobile technology, parents also acknowledge some uncertainty regarding how best to navigate the incorporation of multiple mobile devices into their children's daily lives. For example, Ortiz, Green, and Lim (2011) found that parents viewed current technology as important to their child's academic and future job success, whereas findings from several studies suggest parents worry about the negative impact of media on their child (Lampard, Jurkowski, & Davison, 2013a; Padilla-Walker, 2006), particularly regarding physical activity and especially when considering the impact of video games (Wartella, Rideout, Lauricella, & Connell, 2014). As these technological devices become more prevalent in family life, it is likely that the parent's resolution of these competing beliefs may influence how they choose to regulate their child's access to media. However, even when parents desire to place limits on their child's use of digital technology, they struggle to do so (Jordan, Hersey, McDivitt, & Heitzler, 2006).

Parental concerns about their child's screen time, combined with an accelerating increase in media use and the subsequent potential negative impact of these media devices, place parents in the difficult position of attempting to adequately regulate their child's screen time access. To date, however, few studies have examined the link between parental perceived concern for these media devices and the management of their child's media use in the home. Utilizing a family systems framework to better understand the influence of parents on their child's media use and psychological outcomes, the current study proposes and tests a model linking parental perceptions about these media devices and their parenting strategies when their child utilizes these devices in the home. In turn, the association of these parenting strategies with youth screen time is examined. Given the rise in the uptake of a broad range of mobile devices among families, including tablet devices which prior studies have not considered, we include screen time on five devices: television, computers, smartphones, tablets, and video game consoles (both handheld and stationary). Finally, the link of screen time to youth internalizing and externalizing problems is examined. The model is presented in Fig. 1. In the following section, we present why screen time is a concern for parents. In subsequent sections we then build the case for our model, moving from parental perceptions of technology to technology-related rules in the home and, finally, to youth screen time. Subsequently, we consider the role of developmental age in screen time.

## 1. The negative outcomes of excessive screen time

The current literature supports parental concerns about excessive screen time in childhood. Total daily screen time, a metric of summed

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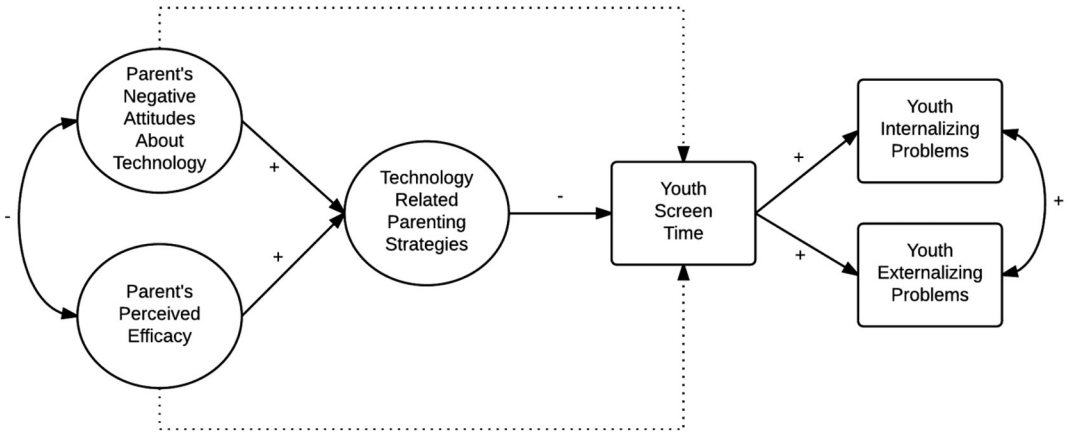


**Fig. 1.** Theoretical model delineating the indirect influence of parent's perceptions of technology on their technology focused parenting and their children's screen time and problem behavior.

exposure to devices capable of displaying video content (e.g., smartphones, tablets, computers, TVs, and video game consoles) for children 8- to 18-years-old, has risen from five to roughly seven and a half hours since 1999, far exceeding the American Academy of Pediatric's recommendation of two hours or less (American Academy of Pediatrics, 2013; Rideout, Foehr, & Roberts, 2010). In spite of the potential benefits of technology, past research suggests that too much screen time may be associated with a host of negative outcomes for children. Research focusing on excessive screen time in childhood (e.g., television, computers, video game consoles etc.) has revealed links with physical and behavioral health problems, including increased body mass index (BMI; Marshall, Biddle, Gorely, Cameron, & Murdey, 2004; Wake, Hesketh, & Waters, 2003) and academic difficulties (Rideout et al., 2010). Of interest in the present study is the potential link between youth screen time and *mental* health problems, including internalizing (e.g., depression and anxiety) and externalizing (e.g., aggression) symptoms. For example, although little research to date has examined the link between internalizing symptoms and screen time in childhood, a few studies suggest that increased screen time is associated with increased depressive symptoms and overall psychological difficulties (Breland, Fox, & Horowitz, 2013; de Wit, van Straten, Lamers, Cuijpers, & Penninx, 2011; Page, Cooper, Griew, & Jago, 2010). In contrast, a broad literature has revealed consistent links between children's exposure to violent media and increases in aggressive behavior (e.g., Anderson, 2004; Manganello & Taylor, 2009; Zimmerman & Christakis, 2007). Both longitudinal (e.g., Gentile, Coyne, & Walsh, 2011; Ostrov, Gentile, & Crick, 2006; Swing, Gentile, Anderson, & Walsh, 2010) and experimental (e.g., Coyne, Archer, & Eslea, 2004) studies support the relationship between screen time and problem behaviors. The mental health difficulties of youth may reflect problems related to increased exposure to developmentally inappropriate content as well as decreases in exposure to other healthy activities such as exercise, creative play, or engagement with others. Overall, our focus on these broad mental health constructs reflects the concerns that (1) the prevalence of mental health challenges in childhood have increased in recent years (Perou et al., 2013), (2) media use in family households has dramatically risen in as recently as the last five years (e.g., Pew Research Center, 2014), and (3) a broad literature has identified mental health challenges linked to excessive screen time (e.g., Anderson, 2004; Gentile et al., 2011; Page et al., 2010). Further, although children may use media devices for a variety of educational or creative reasons, evidence suggests they are most often consuming media that is developmentally inappropriate or lacking educational content (see Forehand & Long, 2010). Given these concerns, we expect youth screen time will be associated with more internalizing and externalizing problems.

## 2. Parental perceptions of technology

From a family systems framework, children's behavior in the home reflects a confluence of relationships within the household and, thus, these relationships must be understood when determining the development of various child outcomes (Bochner & Eisenberg, 1987). This framework has been applied to media use in the home, with researchers suggesting that children's screen time is linked to norms in the household which are determined in part by individual level variables, including parental beliefs and attitudes about how often and in what ways media devices are used in the home (Coyne, Padilla-Walker, Fraser, Fellows, & Day, 2014; Calvert, Jordan, & Cocking, 2002; Jordan et al., 2006). Not surprisingly, these beliefs and attitudes are, in turn, linked to dyadic level variables that effect the parent–child relationship, particularly parenting strategies used in the household (Padilla-Walker, 2006). In the present study we examine two components of parental perceptions of technology that likely contribute to subsequent parenting strategies and may have a rippling effect on child individual level variables, specifically their child's media use and psychosocial outcomes, in the home: perceived parental efficacy with and parental negative attitudes towards technology.

Social Cognitive Theory (Bandura, 1999) proposes that expectations of efficacy influence the degree to which individuals put forth and sustain effort despite difficulty. This theory has been applied to parenting (see Coleman & Karraker, 1998, for a review), with evidence supporting the association between parental perceptions of their ability to influence their child's development and their subsequent success (Brody, Flor, & Gibson, 1999). Indeed, parenting self-efficacy is associated with greater parental involvement and monitoring (Bogenschneider, Small, & Tsay, 1997; Shumow & Lomax, 2002) and interventions focusing on this construct have led to higher levels of appropriate limit setting with children (Miller-Heyl, MacPhee, & Fritz, 1998). Recent research (e.g., Lampard et al., 2013a; Lampard, Jurkowski, & Davison, 2013b) suggests that a parent's perceived self-efficacy also applies to their management of their child's screen time.

Similarly, parental attitudes about the media devices in their home may impact the quantity and quality of screen time exposure for their children. Although researchers have only begun to examine these relationships, preliminary evidence suggests that parents who exhibit negative attitudes about the use of technology in the home (e.g., harmful effects of media) are more likely to report less screen time for their youth (Nathanson, Eveland, Park, & Paul, 2002; Padilla-Walker, 2006) whereas those with positive attitudes report greater youth screen time (e.g., Vaala & Hornik, 2014). Unfortunately, much of this work is limited by a narrow age range of children studied, limited media devices

which are examined, and broad (rather than technology-related) attitude measures. For example, Vaala and Hornik's study was limited to a young developmental age (3–27 months old), TV/video viewing only, and general perceptions of behavioral control. In the present study we build upon the existing literature by examining a wide age range of children, parents' beliefs and attitudes about a range of media devices, and both their attitudes and perceived self-efficacy assessed in regard to managing their child's use of media devices. We propose that parents who perceive technology as having a negative influence are more likely to have rules and enforcement strategies in order to limit their child's access to technology. In addition, we hypothesize that parents who perceive themselves as efficacious when managing these devices will use more rules and enforcement strategies. In sum, parental perceptions of technology, specifically their negative attitudes about these devices and their perceived self-efficacy when managing them, may be a promising area of research that can help elucidate why parents set and enforce rules about technology.

## 3. Technology-focused rules and youth screen time

Turning to the next link in our model, both research and theory (e.g., Social Interaction Learning Model) suggest that parents play an important role in a child's development through parenting behavior such as involvement and behavioral control, often in the form of monitoring and rule-setting (Patterson, Reid, & Dishion, 1992; see McKee, Jones, Forehand, & Cuellar, 2013, for a review). As one of many layers in the family system, parent's rules in the home set the stage for their child's behavior. Consistent with this perspective, past research suggests parental rules around media use are associated with reduced screen time for children (i.e., television, video games, & computer/internet use) (Ramirez et al., 2011; Vandewater, Park, Huang, & Wartella, 2005) and that these parental rules are related to lower levels of problem behaviors (Bumpus & Werner, 2009). Since a family systems approach to media use in the home was originally proposed (Jordan, 2002), a plethora of mobile media devices have been commercially developed, fundamentally changing the media landscape in the home and shifting away from television as the "digital hearth" towards greater independent media use among family members. In order to allow research to continue to evolve with family access to and uptake of technology, the current study includes the association of technology-related parenting strategies to total screen time across the multiple devices currently available in a family's home (e.g., computers, tablets, and other mobile media devices). Therefore, not only do we propose and test a model of parental roles in youth screen time and problem behaviors but we update prior research by inclusion of modern media devices.

## 4. Child developmental age and screen time

A limitation to the existing literature on parental rules and youth screen time is that the broad range of a child's developing years from preschool through adolescence has not been examined. Parents may have different expectations and exert varying degrees of control for screen time depending on the age of their child. Indeed, past research suggests that parents find it more difficult to implement media rules in the household with older children (Jordan et al., 2006), a finding consistent with other studies suggesting that rules for and monitoring of various types of screen time decrease as children increase in age (Rideout et al., 2010; Rosen, Cheever, & Carrier, 2008; Wartella et al., 2014). Media use also has been shown to influence children differently across age groups because of the developmental tasks they face. For example, media use is more likely to negatively impact academic success for older children and adolescents who have greater academic demands, whereas for younger children the influence of media may be more in absorbing time previously spent in creative play or other physical activity (see (Jordan, 2004), for a review). The absence of samples across the full developmental age range within a study makes it difficult to reach conclusions across developmental stages about the roles of parental beliefs and behaviors in children's screen time and problem behaviors. In the present study we examine three broad age ranges (3–7, 8–12, and 12–17 years old) in order to better understand the contribution of parenting and child media use to child outcomes at different stages of child development.

## 5. The current study

In order to better understand the complex family contributions to child media use, the current study extends the literature on parenting and youth screen time by examining the associations among parental perceptions of technology, technology-related parenting strategies (i.e., rules and enforcement strategies), youth screen time, and youth problem behaviors. Using structural equation modeling, we test the model in Fig. 1. The hypothesized direction of association for each link in the model is depicted in the figure. Of importance, building on Darling & Steinberg's (1993) unheeded call over 20 years ago for research on parenting across developmental stages, we examine our model in families with children at different developmental stages: young childhood (3–7 years), middle childhood (8–12 years), and adolescence (13–17 years). These age groups were chosen a priori based on typical age divisions of prevention and intervention that involve parenting as a primary component (e.g., young children: McMahon & Forehand, 2003; middle childhood: Kazdin, 2010; adolescence: Patterson & Forehand, 2005) in order to more directly inform the development of programs to help parents manage their children's screen time at different developmental stages. Although specific socialization goals (e.g., enhancing peer relationships, reducing opportunities for delinquent acts) and related parenting behaviors (e.g., monitoring) vary by developmental stage of the child, the influence of parental perceptions of technology on (i.e., attitudes and self-efficacy) technology-focused parenting strategies (i.e., rules and enforcement strategies) likely apply across developmental stages as these processes are parent-focused processes that are not hypothesized to vary as a function of the child's developmental stage. For the hypothesized link between technology-focused parenting strategies and youth screen time, we expect weaker associations as children increase in age, particularly into the adolescent years. As Steinberg & Silk (2002) have pointed out, the adolescent years are associated with increases in unsupervised time and more exposure to self-directed mass media. Both of these developments should be associated with less parental influences over screen time. Lastly, the association between children's media use and psychosocial adjustment has been shown across developmental periods from young childhood (e.g., Parkes, Sweeting, Wight, & Henderson, 2013; Zimmerman & Christakis, 2007) to middle childhood (e.g., Harrison & Hefner, 2006; Page et al., 2010) to adolescence (e.g., Gopinath et al., 2012; Kremer et al., 2014). Therefore, we hypothesized that this link would not differ across developmental stages.

## 6. Method

### 6.1. Participants

Parents were recruited online through Amazon's Mechanical Turk (MTurk) as part of a larger study on the assessment of parenting. MTurk is currently the dominant crowdsourcing application in the social sciences (Chandler, Mueller, & Paolacci, 2014) and prior research has convincingly demonstrated that data obtained via crowdsourcing methods are as reliable as those obtained via more traditional data collection methods (e.g., Buhrmester, Kwang, & Gosling, 2011; Casler, Bickel, & Hackett, 2013; Paolacci & Chandler, 2014; Shapiro, Chandler, & Mueller, 2013). Parents responded to a study that was listed separately for three age groups to ensure roughly equal sample sizes in each group: young childhood (3 to 7 years old), middle childhood (8 to 12 years old), and adolescence (13 to 17 years old). The total sample

of 615 parents of children between the ages of three and seventeen was analyzed for the current study. Demographics by sample (young, school, and adolescent samples) are presented in Table 1.

## 7. Procedure

All study procedures were approved by the Institutional Review Board at the University of Vermont. All parents were consented online before beginning the survey in accordance with the approved IBR procedures. Three different studies were listed on MTurk (one for each child age range) for $2.00 in compensation. For families with multiple children in the target age range, one child was randomly selected through a computer algorithm while parents were taking the survey and measures were asked in reference to parenting specific to this child. Participants were recruited from MTurk under the restriction that they were U.S. residents and had at least a 90% task approval rate for their previous HITs. Ten attention check items were placed throughout the online survey. These questions asked participants to enter a specific response such as "Please select the Almost Never response option" that changed throughout the survey appearing in random order within other survey items. Participants (N = 9) were not included in the study if they had more than one incorrect response to these ten check items to ensure that responses were not random or automated.

**Table 1**
Sample demographic characteristics by study.

| | M (S.D.) or percentage | | |
|---|---|---|---|
| | Young childhood $n = 210$ | Middle childhood $n = 200$ | Adolescents $n = 205$ |
| Parent age | 32.61 (7.44) | 34.43 (6.92) | 40.54 (18.34) |
| Parent (% mothers) | 59.0% | 51.0% | 53.2% |
| Parent race | | | |
| White | 78.4% | 72.7% | 80.5% |
| Black | 12.0% | 17.3% | 10.2% |
| Latino/a | 4.3% | 3.5% | 5.4% |
| Asian | 5.3% | 4.5% | 2.4% |
| Other | 0.0% | 2.0% | 1.5% |
| Parent marital status | | | |
| Single | 17.0% | 21.1% | 21.9% |
| Cohabitating | 60.2% | 58.3% | 58.2% |
| Married | 22.8% | 20.6% | 19.9% |
| Parent education | | | |
| Did not complete H.S. | 0.5% | 1.0% | 1.5% |
| H.S. or GED | 11.9% | 14.0% | 16.6% |
| Some college | 35.2% | 33.5% | 28.8% |
| College degree | 36.2% | 36.5% | 41.5% |
| >College degree | 16.2% | 15.0% | 11.8% |
| Parent employment status | | | |
| Full-time | 56.2% | 59.0% | 63.9% |
| Half-time | 20.0% | 20.5% | 23.4% |
| Unemployed | 23.8% | 20.5% | 12.7% |
| Family income | | | |
| Under $30,000 | 24.3% | 27.0% | 24.9% |
| $30,000–$49,999 | 31.9% | 15.5% | 26.8% |
| $50,000–$69,999 | 20.4% | 20.0% | 24.4% |
| $70,000–$99,999 | 14.8% | 15.5% | 16.1% |
| $100,000 or more | 8.6% | 12.0% | 7.8% |
| Family neighborhood | | | |
| Urban | 27.6% | 23.5% | 28.3% |
| Suburban | 51.0% | 54.0% | 53.7% |
| Rural | 21.4% | 22.5% | 18.0% |
| Number of children | 1.75 (.92) | 1.77 (.89) | 1.83 (.90) |
| Child age | 4.75 (1.34) | 9.3 (1.22) | 14.42 (1.38) |
| Child birth order | | | |
| First born | 27.1% | 32.0% | 43.4% |
| Middle child | 7.6% | 10.0% | 6.3% |
| Youngest child | 25.7% | 19.5% | 20.5% |
| Only child | 39.5% | 38.5% | 29.8% |
| Child gender (% Girls) | 47.1% | 45.0% | 37.1% |

## 8. Measures

### 8.1. Demographic information

Parents responded to demographic questions about themselves (e.g., parental age, education), their families (e.g., household income), and the target child (e.g., gender, age).

### 8.2. Parent's perceptions of technology

As there are no existing technology scales assessing both parental negative beliefs and their own self-efficacy about technology, the 15-item Parental Perceptions of Technology Scale (PPTS; Sanders & Parent, 2014) was developed for this study. Item content was developed from pilot research in a prevention context with parents who expressed concerns about their children's technology use. The PPTS is a scale that reflects parents' negative beliefs about electronic media devices (i.e., TVs, computers, video game consoles, and tablets) and their perceived efficacy in managing these devices. The Negative Attitudes about Technology subscale included items representing general dislike and distrust of technology (e.g., "Electronic media devices make people lazy;" "Life was easier before these types of devices became popular"), as well as distrust specific to their child's technology use (e.g., "My child will be exposed to illicit material if they use these devices;" "My child would be better off without electronic media devices in schools"). The Perceived Parental Efficacy subscale included items about general perceptions of difficulty with technology use (e.g., "Electronic media devices like computers, tablets, and smartphones are too difficult to use") and items focused on parental ability to implement controls (e.g., "I won't bother setting parental controls or passwords because my kids will "hack" around them;" "It's too difficult to set passwords/parental controls on my devices."). Parents indicated their level of agreement with each of the 15 items on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items were summed for the Negative Attitudes about Technology subscale. For the Perceived Parental Efficacy subscale, items were reverse-coded so that higher scores reflected more efficacy with technology.

A confirmatory factor analysis was conducted using the current sample. Items with non-significant or substantial cross-loadings (indicated by modification indices) were dropped from the scale (total of five). Results confirmed the hypothesized two-factor model on the final 10 items across all three samples (RMSEA ranged from .01 to .06, CFI ranged from .95 to 1.0). See Table 2 for factor loadings across each developmental stage. The alpha coefficient for the Negative Attitudes (4 items; $M = 9.72$, $SD = 3.42$) and Perceived Parental Efficacy (6 items; $M = 20.93$, $SD = 4.53$) subscales across the three samples was .72 and .83, respectively.

### 8.3. Technology-related parenting strategies

The Technology-related Parenting Scale (TPS; Sanders, Parent, Forehand, & Breslend, 2016) was used to assess behavioral control specifically in regard to children's technology use. Parents responded to eight questions that described potential rules (e.g., "limits on the amount of time," and "limits on the type of content allowed") and enforcement strategies (e.g., "Consequences if the child accesses when not allowed," and "Passwords on these devices") they use for their child's screen time in the home. For each item, parents rated how true it was for them in the last month on a Likert scale ranging from 0 (not true) to 2 (very true). Items were scored such that higher scores reflect more parental rules around child technology use ($M = 10.39$, $SD = 4.43$). Previous research supports the use of the TPS across child development stages as well as supporting initial discriminant and concurrent validity (Sanders et al., 2016). The alpha coefficient for this scale across the three samples was .87.

**Table 2**
Parental Perceptions of Technology Scale (PPTS) factor loadings.

| | | Standardized estimate [95% CI] | | |
|---|---|---|---|---|
| | | Young | Middle | Adolescence |
| *Negative Attitudes about Technology* | | | | |
| 3 | My child will be exposed to illicit material if they use these devices. | .38 [.28–.48] | .37 [.27–.47] | .36 [.28–.45] |
| 10 | Electronic media devices make people lazy. | .63 [.56–.71] | .64 [.55–.73] | .63 [.54–.72] |
| 12 | My child would be better off without electronic media devices in schools. | .82 [.75–.90] | .78 [.71–.86] | .77 [.68–.86] |
| 14 | Life was easier before these types of devices became popular. | .74 [.66–.82] | .72 [.62–.82] | .73 [.63–.83] |
| *Perceived Efficacy* | | | | |
| 1 | Electronic media devices like computers, tablets, and smartphones are too difficult to use. (Reverse-coded) | .70 [.60–.81] | .75 [.66–.84] | .72 [.64–.79] |
| 4 | My child knows more about these devices than I ever will. (Reverse-coded) | .66 [.57–.75] | .63 [.55–.72] | .60 [.52–.68] |
| 5 | I won't bother setting parental controls or passwords because my kids will "hack" around them. (Reverse-coded) | .64 [.55–.74] | .57 [.48–.67] | .53 [.42–.63] |
| 7 | I am confident in my abilities to utilize electronic media devices. | .66 [.56–.76] | .65 [.56–.74] | .74 [.65–.83] |
| 9 | It's too difficult to set passwords/parental controls on my devices. (Reverse-coded) | .75 [.68–.82] | .74 [.65–.82] | .76 [.68–.84] |
| 13 | I find new technology intimidating. (Reverse-coded) | .66 [.55–.76] | .71 [.61–.80] | .75 [.64–.85] |

Note: All factor loadings significant at $p < .001$.

### 8.4. Youth weekly screen time

Parents were asked two questions regarding their child's screen time. First, parent were asked "Now thinking about [target child]'s typical activities, on a typical *weekday* how much time does [target child] spend doing each of the following at home?" Then, parents were asked the same question but in regard to their child's use during the *weekend*. Parents responded with the number of hours and/or minutes (hours and minutes columns were presented and a response was required on each of at least 0) their child engaged in each day of the following activities: (1) Watching TV or DVDs, (2) using the computer, (3) playing video games on a console game player (such as: Xbox, Playstation, Wii), (4) playing on a handheld game console like a Gameboy, PSP, or DS, (5) using a tablet computer (such as iPad), and (6) using a smart phone for things like playing games, watching videos, or surfing the Internet (not including time spent talking on the phone). The two video game activities (video games on console players and handheld devices) were combined into one activity of "video games." A daily use (averaged across the weekend and weekday) was calculated by device and then summed across all devices. This sum was used as our measure for youth screen time. Outliers more than two standard deviations above the mean (which were beyond possible daily totals) were winsorized and assigned the value highest value at two standard deviations (Little, 2013). The method employed in the current study to measure youth screen time was similar to those used by major industry reports (e.g., Rideout et al., 2010).

### 8.5. Youth internalizing and externalizing problems

The caregiver form of the 12-item Brief Problem Checklist (BPC; Chorpita et al., 2010) was used in the current study to measure youth internalizing and externalizing problems. The BPC was developed by applying item response theory and factor analysis to the Youth Self-Report (YSR; Achenbach & Rescorla, 2001) and Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). Thus, BPC items were selected specifically to be maximally and nonredundantly sensitive in a range from approximately the 50th to the 95th percentile on a nonclinical distribution. For example, items such as "attacks others" (externalizing) and "suspicious" (internalizing) or "demands attention" (externalizing) and "nervous" (internalizing) were discarded because their item location parameters suggested that they discriminated respondents only at the very high or very low end of their respective latent traits. The remaining items were those items with the highest discrimination parameters across child and caregiver results. Chorpita et al. (2010) found that the internal consistency and test–retest reliability of the BPC were excellent, and factor analyses yielded one externalizing (e.g., "argues a lot"; "disobedient at home or at school") and one internalizing (e.g., "feels worthless or inferior"; "too fearful or anxious") factor. Furthermore, validity tests showed large and significant correlations with corresponding scales of the CBCL and YSR as well as with diagnoses obtained from a structured diagnostic interview (Chorpita et al., 2010). The alpha coefficient for internalizing ($M = 1.46$, $SD = 2.02$) and externalizing ($M = 1.79$, $SD = 2.32$) problems averaged across the three samples for the current study was .80 and .84, respectively.

## 9. Data analytic plan

### 9.1. Preliminary analysis of demographic and study variables

The effect of demographic variables (i.e., parent age, parent gender, parent race, parent education, family income, marital status, youth age, and youth gender) on the primary outcomes was examined using bivariate correlations. If significant associations emerged between demographic variables and primary model variables, those demographic variables were controlled for in primary analyses. We examined all demographic variables as covariates as there is limited research on the role of these variables in technology use studies. This approach is a conservative one but appropriate for the stage of development of the field at the current time.

### 9.2. Evaluation of the structural model

Structural equation modeling to test the hypothesized model was conducted with Mplus 6.1 software (Muthen & Muthen, 2010). To account for skewed data, maximum likelihood estimation with robust standard errors (MLR) was used. The following fit statistics were employed to evaluate model fit: Chi-square ($\chi^2$: $p > .05$ excellent), Comparative Fit Index (CFI; >.90 acceptable, >.95 excellent), Root Mean Square Error of Approximation (RMSEA; <.08 acceptable, <.05 excellent) and the Standardized Root Mean Square Residual (SRMR; <.08 acceptable, <.05 excellent) (Hu & Bentler, 1999). As missing data were less than 1% overall for all core variables, the mechanism of missingness was treated as ignorable (missing at random) and full information maximum likelihood estimation techniques were used for inclusion of all available data.

Although not included in the proposed conceptual model presented in Fig. 1, the effects of significant control variables (e.g., parent gender, youth gender, family income) on the model were examined by running a multiple-indicator/multiple-cause (MIMIC; Muthén, 1989). The MIMIC model has important advantages over other strategies for examining the influence of covariates in SEM (e.g., multiple group models) including being more parsimonious, allows researchers to consider multiple covariates that would become unmanageable in multiple group analysis, and is equally appropriate for categorical, continuous manifest, latent manifest, and a mixture of these different types of

covariates. In the MIMIC models all major constructs of the final model were regressed on the covariates separately. If paths in the structural model remained significant with equivalent effect sizes with the inclusion of these covariates, it was concluded that the control variables did not influence the relations among variables in the model. If paths in the model become non-significant and/or effect sizes changed meaningfully, covariates were retained in the model and the covariate adjusted results were reported.

## 10. Results

### 10.1. Preliminary analysis

Family ownership percentage and youth weekly screen time for each technology device by youth developmental stage and gender is presented in Table 3. Average screen time summed across all devices varied across age ranges (young childhood $M = 7.3$, middle childhood $M = 8.4$, adolescence $M = 9.7$), with an overall average across all ages of 8.5 h.

Prior to preliminary analyses, three demographic variables were dichotomized based on sample size in groups and inspection of the means. Race was dichotomized to White (1) or a Person of Color (2), marital status was dichotomized to single (1) or in a relationship (2), and parent education was dichotomized to some college or less (1) or college degree or more (2).

Correlations between the variables in Fig. 1 and eight assessed demographic variables were conducted separated by each sample. Among the young childhood sample, all eight demographic variables were associated with at least one of the six variables in the model and, thus, served as covariates in the MIMIC models. Among the middle childhood sample, parent age, parent gender, family income, and marital status were associated with at least one of the variables in the model and, thus, served as covariates in the MIMIC models. Lastly, marital status and youth gender, but no other demographic variables, were significantly associated with at least one variable in the model in the adolescent sample and, thus, served as covariates in the MIMIC models.

## 11. Primary analyses

### 11.1. Evaluation of the measurement model

In all models, the first indicator for each latent factor was set at 1.0 to establish the metric, and all factors were allowed to covary freely. Standardized factor loadings are reported. Inspection of the initial measurement model using modification indices suggested that freeing the error between two indicators of the enforcement strategies latent construct would improve fit. The two items were similar in content and wording (i.e., "limits on when it can be accessed and place limits using parental control features;" "passwords on devices and place limits using parental control features"); therefore, there are substantive reasons that they would have correlated error. Across all three samples, factor loadings were significant, above .40 (except one indicator in the adolescent sample). The final measurement model demonstrated good to acceptable fit for the young childhood [$\chi^2$ (130, N = 210) = 203.51, $p < .01$, RMSEA = .05, 95% CI .04–.07, CFI = .94, SRMR = .06], middle childhood [$\chi^2$ (130, N = 200) = 169.18, $p < .05$, RMSEA = .04, 95% CI .02–.06, CFI = .96, SRMR = .057], and adolescent [$\chi^2$ (130, N = 205) = 244.79, $p < .01$, RMSEA = .07, 95% CI .05–.08, CFI = .90, SRMR = .08] samples.

### 11.2. Evaluation of the structural model

The results of the structural model for the young childhood, middle childhood, and adolescent samples are presented in Table 4 and Fig. 2. The proposed model demonstrated good fit for the young childhood [$\chi^2$ (181, N = 210) = 276.84, $p < .01$, RMSEA = .05, 95% CI .04–.06, CFI = .93, SRMR = .07] and middle childhood [$\chi^2$ (181, N = 200) = 237.69, $p < .01$, RMSEA = .04, 95% CI .02–.05, CFI = .95, SRMR = .06] samples but fit ranged from acceptable to poor for the adolescent sample [$\chi^2$ (181, N = 205) = 341.16, $p < .01$, RMSEA = .07, 95% CI .06–.08, CFI = .88, SRMR = .09]. Model results by sample are presented in further detail below.

### 11.3. Young childhood sample

Parent's negative attitudes about technology were negatively correlated with their perceived parental efficacy with technology. Parents who perceived themselves as efficacious in managing technology reported using more technology-related parenting strategies (e.g., setting and enforcing rules around their young child's technology use). Parent's negative attitudes about technology were not related to technology-related parenting practices. Use of technology-related parenting strategies was related to young children's screen time such that higher levels of setting and enforcing rules about their child's technology use were related to lower levels of youth screen time. Furthermore, greater parental perceived parental efficacy with technology, but not parent's negative attitudes about technology, was directly and negatively related to youth screen time. In regard to youth problem behaviors, internalizing and externalizing problems were positively correlated and higher levels of youth screen time were related to higher levels of both youth internalizing and externalizing problems.

### 11.4. Middle childhood sample

Similar to the young childhood sample, parent's perceived efficacy was positively related to their technology-related parenting strategies. In turn, these strategies were related to screen time. However, in contrast to the young childhood sample, negative attitudes about technology, but not perceived efficacy, was directly related to youth screen time and the direct paths from youth screen time to each problem behavior was not statistically significant ($p < .05$). However, these relationships were marginal ($p < .10$) and had standardized estimates similar to those found in the young childhood sample.

**Table 3**
Family ownership percentage and youth weekly screen time in hours for each device by dataset.

| | Young childhood | | | Middle childhood | | | Adolescence | | |
|---|---|---|---|---|---|---|---|---|---|
| | % own | Boys | Girls | % own | Boys | Girls | % own | Boys | Girls |
| Watching TV or DVDs[a] | 74.3% | 2.55 | 2.55 | 74.5% | 2.57 | 2.20 | 79.5% | 2.53 | 2.44 |
| Using the computer | 93.8% | 2.32 | 1.65 | 95.0% | 2.23 | 1.80 | 93.2% | 3.07 | 3.48 |
| Video games | 70.0% | 1.13 | 1.13 | 82.0% | 1.90 | 1.94 | 74.2% | 2.45 | 1.04 |
| Tablet computer | 54.8% | 0.96 | 0.75 | 59.0% | 1.13 | 1.13 | 50.2% | 0.92 | 0.53 |
| Smartphone (not talking) | 77.1% | 0.98 | 0.61 | 80.5% | 0.85 | 1.16 | 74.1% | 1.44 | 1.58 |
| Total | 99.5% | 7.94 | 6.70 | 99.5% | 8.68 | 8.23 | 99.5% | 10.41 | 9.07 |

Note: N = 615.
[a] The ownership question asked if a family had cable or satellite TV, not more generally about TV ownership. The child screen time question about TV or DVDs, which was of primary importance for our own purpose, was not restricted to cable or satellite but asked by watching TV or DVDs generally.

**Table 4**
Standardized estimates for the final structural model by study sample.

| | Standardized estimate [95% CI] | | |
|---|---|---|---|
| | Young | Middle | Adolescence |
| *Direct effects* | | | |
| Negative Attitudes–Parenting | .12 [−.14 to .38] | .20$^{+}$ [−.02 to .42] | .24$^{**}$ [.06 to .43] |
| Efficacy–Parenting | .35$^{*}$ [.60 to .11] | .41$^{**}$ [.63 to .20] | .55$^{**}$ [.73 to .37] |
| Parenting–Screen Time | −.22$^{**}$ [−.37 to −.07] | −.23$^{*}$ [−.40 to −.06] | −.11 [−.28 to .06] |
| Negative Attitudes–Screen Time | −.15 [−.33 to .03] | .23$^{*}$ [.02 to .44] | −.12 [−.31 to .07] |
| Efficacy–Screen Time | −.32$^{**}$ [−.12 to −.53] | .03 [.27 to −.20] | −.17 [.07 to −.41] |
| Screen Time–Child Internalizing | .23$^{**}$ [.02 to .30] | .14$^{+}$ [−.02 to .30] | .18$^{*}$ [.01 to .35] |
| Screen Time–Child Externalizing | .16$^{*}$ [.02 to .37] | .15$^{+}$ [−.02 to .32] | .07 [−.10 to .24] |
| *Correlations* | | | |
| Negative Attitudes WITH Efficacy | −.58$^{**}$ [−.44 to −.72] | −.55$^{**}$ [−.41 to −.70] | −.54$^{**}$ [−.39 to −.69] |
| Internalizing WITH Externalizing | .51$^{**}$ [.39 to .63] | .44$^{**}$ [.31 to .57] | .55$^{**}$ [.40 to .70] |

$^{+}$ $p < .10$.
$^{*}$ $p < .05$.
$^{**}$ $p < .01$.

### 11.5. Adolescent sample

Beyond the poorer fit of the structural model, the major difference in results between the adolescent and the two childhood samples was the absence of a relation in the adolescent sample between technology-related parenting strategies and youth screen time. In addition, direct relations between either of the parental perceptions of technology subscales and youth screen time were not significant but both of these subscales were related to technology-related parenting strategies.

### 11.6. MIMIC models

The effects of significant covariates were tested by running MIMIC models. All the outcome variables were regressed on the control variables separately. For the young childhood and middle childhood samples, all pathways were unaffected by the inclusion of the covariates in the model. For the adolescent sample, the path from parental negative attitudes about technology to technology-related parenting strategies was no longer significant when youth gender served as the covariate. All other pathways were unaffected by the inclusion of the covariates in the model for the adolescent sample. Overall, with the exception of negative attitudes to technology-related parenting, paths in the structural model across all three samples were unaffected by the inclusion of the control variables; thus, it was concluded that the control variables did not influence the original relationships among variables in the model.

## 12. Discussion

In this study we examined the associations between parental perceptions about technology, technology-focused parenting strategies, amount of daily screen time, and youth problem behaviors across three age ranges. Our hypotheses were partially supported. First, parent's perceived efficacy was related to technology-related parenting strategies across all three age groups; however, counter to our hypotheses, parent's negative attitudes about technology were not related to technology-related parenting in any age group once a covariate was accounted for with adolescents. Second, as hypothesized, a weaker association was found between technology-related parenting strategies and youth screen time for older youth, specifically adolescents. Third, our hypothesized link between screen time and problem behaviors only emerged in young childhood.

Consistent with prior research (Rideout et al., 2010), we found that children are spending substantially greater time in front of a screen (8.5 h) than recommended by the American Academy of Pediatrics (American Academy of Pediatrics, 2013). Our findings may be inflated due to children viewing multiple screens at once; however, even with this caveat, screen time constitutes a major portion of children's day. Not surprisingly, screen time increases by approximately an hour per day as children move across the developmental ages we examined (see Table 3). For young and middle age children, television continues to dominate children's viewing, whereas adolescents spend the most screen time on computers. The latter finding likely reflects both the increasing unsupervised time of adolescence (Steinberg & Silk, 2002) and demand for technology use to complete academic assignments. In terms of newer technology, both tablets and smartphones are currently being used at a lower level than other devices; however, of importance, these devices do account for one to two hours of daily screen time at all age levels and likely will be increasingly used. Given their significant use across all age ranges, future research should incorporate these devices in estimates of screen time. Finally, of note, smartphone use (for uses other than talking) surges beginning at adolescence.

The model we proposed received strong support for the young childhood sample. With one exception, all links in the model were supported. In addition, parent's perceived efficacy also had a direct line to youth screen time, suggesting other variables beyond technology-focused parenting strategies are important in children's screen time. Indeed, as multiple sources from within the household contribute to the family system, it is likely that factors such as general parenting behaviors (e.g., praise), parental characteristics (e.g., depressive symptoms), or more general family variables (e.g., interparental conflict) play a role in the child's overall media use. However, of primary importance, support for our model in young childhood suggests that parental perceptions of technology and parenting behaviors specific to technology are important for the amount of time a youth spends in front of a screen.

The proposed model suggests that researchers need to consider not only the parents' actions, but also their perspectives on technology when studying factors contributing to screen time in the home. Parents' perceptions of their efficacy with media devices not only directly relate to their technology-related parenting strategies, but may influence how they talk about these devices with their children and subsequently how their children perceive the devices. In this way, and consistent with a family systems framework, parental perceptions of media devices may be important for the climate of media use in the household. That is, what is important in determining media use in the home may go beyond technology-related parenting practices. From a family systems perspective, individual level variables, such as parental beliefs and attitudes about technology, can influence a youth's screen time not only through the dyadic interchange around technology-related parenting and youth screen time but through other mechanisms not assesses in this study. For example, parents of higher SES tend to view media use as a “waste of time” and focus their technology-related rules on time rather than content (Jordan, 1991). As a second example, parents may

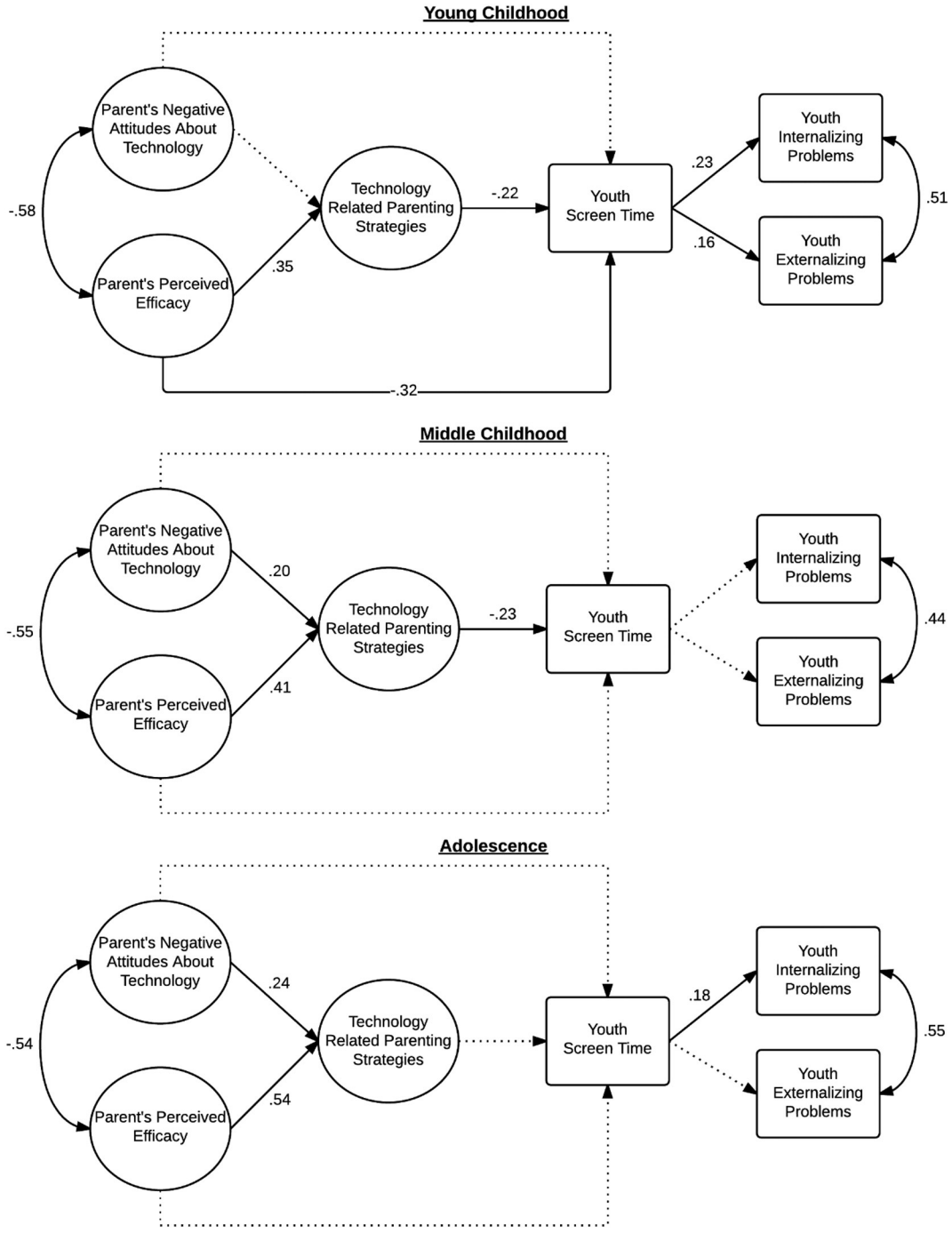


**Fig. 2.** Final structural model with standardized estimates for all three samples.

not impose rules around their child's screen time because they consider their own media use enjoyable and are reluctant to make these changes (Jordan et al., 2006). These findings, as well as those of the present study, suggest it is important for future studies to incorporate not only parental behavior but also parental perspectives on their child's media use in order to better understand the role of media in the family and media's impact on the child.

Although a comprehensive model of parental influence on youth screen time has not been proposed and examined previously, both theory [Social Cognitive Theory (Bandura, 1999) and Social Interaction Learning Model (Patterson et al., 1992)] and research (e.g., Bumpus & Werner, 2009; Miller-Heyl et al., 1998; Ramirez et al., 2011) support the relationships found for individual links among parental perceptions, parental use of technology-related parenting, and youth screen time. Furthermore, considered from a systems perspective, individual dyadic behaviors and beliefs can determine the family milieu of technology use. Our findings, at least for young children, suggest that a starting point for changing the "family technology milieu" is educating parents about technology and about parenting strategies for their children's technology use. Of course, data from intervention studies will be necessary to test this hypothesis. And, as prior research (e.g., Anderson, 2004; Page et al., 2010) and the current findings suggest, less screen time is associated with fewer internalizing and externalizing problems.

Our model was less robust with older, particularly adolescent age, youth. The model for adolescents demonstrated less acceptable fit than the two models for pre-adolescents and, of importance, parental use of technology-related parenting did not relate to adolescent screen time. And, as we have noted, screen time increases in adolescence

relative to that of younger youth. Thus, parents have less influence over screen time during the developmental period when screen time is increasing. From a developmental perspective, these findings are not surprising: adolescence is a time youth strive for and typically acquire increasing independence (Steinberg & Silk, 2002) and, coupled with this independence, technological devices are increasingly available to communicate with peers and access mass media information. It may be that efforts by parents to control their adolescent's technology use through device-specific means, such as parental controls or passwords, is perceived by the adolescent as overly intrusive, encouraging the rejection of their parent's rules. This hypothesis has been suggested in previous studies examining parental rules around technology (Bumpus & Werner, 2009; Valkenburg, Piotrowski, Hermanns, & de Leeuw, 2013) and may represent a unique challenge of managing technology use with adolescents. As a consequence, although parental perceptions of technology relate to their parenting strategies about technology, parents appear to have less influence over an adolescent's screen time. These findings suggest the importance of early parent-focused interventions during the pre-adolescent years aimed at reducing their children's screen time while also highlighting the need for developmentally appropriate and realistic parenting strategies around technology (e.g., recognizing the independence of adolescents, resulting in less supervised time) for adolescents.

In multiple age levels, parents reported a relationship between screen time and youth internalizing problems. Although the direction of effect in this association cannot be determined from our data (e.g., children with more anxiety and/or depression may withdraw from parents and peers and turn to screen time as a distraction), the findings are in agreement with the few existing studies (e.g., de Wit et al., 2011; Page et al., 2010) and extend the literature through our inclusion of a broad age range from young childhood to adolescence. In contrast, only parents of young children in the present study reported a relationship between screen time and externalizing problems. These results may reflect a decreased influence of media use on children's externalizing behavior, as they increase in age, particularly as they enter adolescence; however, the present findings are limited in that our assessment did not incorporate indirect forms of externalizing behavior such as relational or covert aggression. Previous research suggests that media content that displays acts of indirect aggression is associated with increases in this type of aggression in adolescence (Coyne et al., 2004; Stockdale, Coyne, Nelson, & Padilla-Walker, 2013). Thus, future research should assess this form of externalizing behavior in models examining parenting, youth screen time, and youth behavior problems. Our findings do suggest the importance of including measures of behavior problems when studying screen time in children and the association between these variables may differ based on the age of the child.

Limitations in the present study should be noted. First, the cross-sectional nature of the data does not allow for causal conclusions in the present model. It is plausible that the direction of links between variables in our model is not as we proposed. For example, child effects on parent behavior may account for the technology-related parenting strategies link to youth screen time in young and middle childhood: children's insistence on more screen time may lead to parents relinquishing control about screen time. Future research should incorporate longitudinal data in order to examine the effects of parental perceptions of technology on parenting strategies and subsequent youth screen time and problem behaviors. Second, the present study is limited by a lack of multiple informants. Addressing this limitation, particularly by incorporating adolescent self-report of screen time, may provide a more accurate understanding of older children's exposure to screen time. Third, the present study's focus on parents' negative attitudes and the negative effects of screen time precluded the examination of potential positive effects of both parental attitudes and youth screen time. For example, the importance of technology for a child's academic success provides a source of unique tension for parents as they attempt to balance the positive and negative effects of screen time. Future research should incorporate positive effects of screen time, such as academic success, as an additional potential outcome associated with youth screen time. Fourth, it is important to note that media content may have affected the findings, such that children who consume more violent media may exhibit different outcomes than children who consume more prosocial media. It will be important for future research to tease apart these differences in order to determine the importance of these contextual variables in the links among parenting, youth screen time, and child outcomes. Fifth, the effect sizes of our pathways in all models were modest. Moderational analyses could identify groups (e.g., female versus male, lower SES versus higher SES) for whom there are stronger associations among variables in the models. Sixth, although the initial psychometric properties and validity data for the newly developed PPTS are promising, further data supporting reliability and validity is needed. Future research with a variety of samples (e.g., in-person recruitment, clinical and at-risk samples) is needed to confirm the factor structure and support validity of the PPTS, especially using longitudinal designs. Finally, the online nature of participant recruiting in the present study precludes the examination of parents who may not use the internet, possibly as a result of their perceptions of technology. Given that approximately 15% of adults in the United States do not use the internet (Zickuhr, 2013b), it will be important in future research to examine these parents' perceptions of technology and how these perceptions may affect their parenting and their child's screen time access. However, of importance, our findings do apply to those parents within the remaining 85% of U.S. adults who have access to the internet.

Strengths in the present study include the use of rigorous analytical strategies to test a model incorporating parental perceptions of technology, technology-focused parenting strategies, youth screen time, and youth behavioral outcomes; these results provide an important conceptual and analytical basis for future research on this topic. In addition, a large community sample taken across three developmental age ranges allowed for a better understanding of the ways in which parenting around screen time may change as children grow older. Indeed, our findings suggest that parents of adolescents in particular may struggle to provide successful rules and enforcement strategies around screen time for their children.

## 13. Recommendations for interventions

The present study suggests that parents' perceived parental efficacy should be considered when attempting to implement parenting strategies to regulate their children's technology use: Improving parental self-efficacy with technology *may* help parents better manage youth screen time in the home. Our findings also suggest that placing limits on technology may be difficult for parents of older, particularly adolescent age, youth. Thus, intervention efforts may be most fruitful when targeting younger children in order to establish rules and boundaries in this developmental period. These rules and boundaries will likely be easier to maintain once established with younger children than to initially implement with children at an older age. Finally, the results have at least one policy implication. The implementation of the American Academy of Pediatrics recommendation of two hours or less of screen time would appear to be a difficult goal to achieve considering the high rate of use of technology found in this and other studies. We would propose that, while two hours or less of screen time is ideal, it is not likely without a nationwide effort to increase parents' awareness of the potential negative effects of screen time as well as their self-efficacy about and parenting skills for managing their children's technology use. Such an effort is needed in our opinion.

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