

**Digital Screen-Time Limits and Young Children's Psychological Well-Being: Evidence From
a Population-Based Study**

Abstract

There is little empirical understanding of how young children's screen engagement links to their well-being. Data from 19,957 telephone interviews with parents of two- to five-year-olds assessed their children's digital screen use and psychological well-being in terms of caregiver attachment, resilience, curiosity, and positive affect in the past month. Evidence did not support implementing limits (<1 or <2 hours per day) as recommended by the American Academy of Pediatrics, once variability in child ethnicity, age, gender, household income, and caregiver educational attainment were considered. Yet, small parabolic functions linked screen time to attachment and positive affect. Results suggest a critical cost-benefit analysis is needed to determine whether setting firm limits constitutes a judicious use of caregiver and professional resources.

Keywords: digital screen-time; policy; psychological well-being

Introduction

Screen-based media is a ubiquitous feature of early childhood (Lenhart, Smith, Anderson, Duggan, & Perrin, 2015), even for young children under five years old (Duch, Fisher, Ensari, & Harrington, 2013). As the time spent with these technologies has increased (Ofcom, 2015), so too have popular (Bell, Bishop, & Przybylski, 2015) and professional (Council on Communications And Media, 2013) concerns about its possible relations with youth well-being. Though little research has been conducted with young children, the nascent literature suggests relations between family and child factors and screen time (Duch et al., 2013). Studies of young children indicate that age (Certain & Kahn, 2002), body mass (Dennison, Erb, & Jenkins, 2002), and non-Caucasian ethnicity (Thompson, Sibinga, Jennings, Bair-Merritt, & Christakis, 2010), are positively associated with daily screen-based media exposure, whereas child psychosocial flourishing (Hinkley et al., 2014), caregiver education (Barr, Danziger, Hilliard, Andolina, & Ruskis, 2010; Horodynski, Stommel, Brophy-Herb, & Weatherspoon, 2010), and household income (Vandewater et al., 2007) may be negatively related to digital screen time.

Because this research is at an early stage, much of what is known about screen-based media is informed by studies of older children and adolescents (e.g., (Blumberg, Carle, O'Connor, Moore, & Lippman, 2008). This larger body of work suggests that screen time might be linked to lower physical health (Costigan, Barnett, Plotnikoff, & Lubans, 2013), and executive functioning in children and adolescents (Nathanson, Aladé, Sharp, Rasmussen, & Christy, 2014; Reid Chassiakos et al., 2016), though the nature of the links with such outcomes have not been rigorously investigated (Linebarger & Vaala, 2010) and physical correlates of screen-time are not clear (Iannotti, Kogan, Janssen, & Boyce, 2009; Mistry, Minkovitz, Strobino, & Borzekowski, 2007). Such work is necessary because digital screens are widely used by young

people (Ofcom, 2015) and children have internationally recognized rights to be informed (United Nations Assembly, 1999).

With this in mind, there is limited understanding of how screen time links to psychological well-being, especially in young children aged five years or under. Informed by a subset of the findings with older children, the American Academy of Pediatrics (AAP) has issued policy statements regarding screen-based media exposure for young children (Council on Communications And Media, 2011, 2013). These recommendations are based on views of media use as a sedentary activity that is directly harmful to well-being (Page, Cooper, Griew, & Jago, 2010); see additional review in (Ferguson, 2017) and indirectly harmful, through supplanting other, more enriching activities (see review in (Przybylski & Weinstein, 2017), and loss of sleep (Lam, Hiscock, & Wake, 2003). For example, it could be that young children passively watching television may not be engaging in exploratory play, connecting with caregivers, or interacting with peers, and disrupted sleep due to screen use could interrupt baby-caregiver bonds.

Early AAP recommendations were that caregivers limit screen exposure to less than two hours per day (Strasburger, Jordan, & Donnerstein, 2010). The latest revision of this advice, published in 2016, recommends parents limit digital media use for children two to five years old to one hour or less each day (Council on Communications and Media, 2016). Both the old and revised advice have been critiqued as misleading and lacking in empirical support (Ferguson & Beresin, 2017; Linebarger & Vaala, 2010). Because so few studies have examined links with younger children's development, it is not yet clear whether successfully discouraging digital media use in two to five year olds would yield positive benefits. This gap in our understanding is problematic because time-based guidance remains an important aspect of AAP advice.

The present analysis was conducted to examine the benefits of following AAP recommendations in terms of young children's well-being, and to better understand the nature of well-being relations with screen use. Well-being is more than the absence of ill health (Patalay & Fitzsimons, 2016), and reflects a subjective sense of flourishing (Tennant et al., 2007). Research in adult populations indicates that psychological well-being is a multi-faceted construct involving subjective cognitive and emotional judgments that are distinct from low psychopathology (Diener, Suh, Lucas, & Smith, 1999). Further, well-being across the life course has been studied through a variety of theoretical lenses ranging from acute snapshots in terms of social, emotional functioning and life satisfaction (Clarke et al., 2011) to value oriented models that tap a wider range of concepts including purpose in life, growth, and self-acceptance (Ryff, 1989). The specific aspects of psychological well-being used in this study were drafted to reflect social and emotional functioning and to meaningfully apply to the experiences of young children ranging in age from two to five years (U.S. Department of Health and Human Services, 2015). In line with this goal, we operationalized and measured well-being as comprising four characteristics: children's curiosity (Sroufe, 1979), resilience, or adaptive responding to challenges and stressors (Egeland, Carlson, & Sroufe, 1993), attachment to caregivers (Schneider, Atkinson, & Tardif, 2001), and positive affect (Waters, Wippman, & Sroufe, 1979). These facets of well-being have been identified as important indicators of young children's well-being and predictors of healthy development in early childhood (Goldschmied & Jackson, 2004; Lippman, Moore, & McIntosh, 2011; Masten, 2001). Further, in line with our interests here, they result from effective play and childcare of young children (Andersson, 2005; Burdette & Whitaker, 2005; Goldschmied & Jackson, 2004), and predict later learning (Bagdi & Vacca, 2005).

The goal of this research was to draw on a large and representative sample of young children aged two to five years to test four research questions. First, do children who follow the revised 2016 AAP advice to limit digital screen time to one hour per day demonstrate higher levels of psychological well-being compared to those who do not? Second, do children who follow the older 2010 AAP advice to limit digital screen time to two hours per day demonstrate higher levels of psychological well-being compared to those who do not? Third, are there linear links relating daily digital screen time and well-being which indicate harm or benefit as media use increases? And finally, are there parabolic relations which suggest benefits to low or moderate media use only, in line with findings from studies of digital screen time in older children (Ferguson, 2017; Przybylski & Weinstein, 2017)? Whereas our first two research questions were aimed at examining the utility of practical guidance to caregivers, the latter two explored the basic nature of the relations between screen-use and well-being.

Method

Participants

Data were provided through telephone interviews collected as part of the 2011-2012 National Survey of Children's Health (National Center for Health Statistics, 2016). Fieldwork used list-assisted random-digit dialling supplemented with an independent dial of mobile phone numbers to reach caregivers. The sample was evenly divided between male and female children and was comprised of 4,047 two-year-olds, 5,363 three-year-olds, 5,300 four-year-olds, and 5,247 five-year-olds with usable data. The NSCH used the same sampling frame as the Centers for Disease Control National Immunization Survey and the sample under study reflects the general population of American children two to five years old. Child ethnicity (69.4% White, 10.4% Black, 18.2% other), and household income (18.3% were below the poverty line, 8.7%

were at the poverty line, 1.7% were at 133% of the poverty line, 6.7% at 150%, 2.5% at 200%, 16.2% at 250%, 13.5% at 300%, and finally 32.4% at or above 400% of the poverty line), broadly mirrored the general population. All study data, code, and materials are available for download using the Open Science Framework (osf.io/cfb9j).

Outcome Variables: Psychological well-being

Caregivers were asked a series of questions drafted by developmental specialists to measure the psychological well-being of young children (Blumberg et al., 2008; Epps, Park, Huston, & Ripke, 2005). Specifically, caregivers rated four statements reflecting attachment, resilience, curiosity, and positive affect in terms of how true each was of their child's experience in the last month. Caregivers used a 5-point scale ranging from 1 = "*Never*", 2 = "*Rarely*", 3 = "*Sometimes*", 4 = "*Usually*", to 5 = "*Always*" to do so. A total of 19,930 (99.9%) responded to the question about caregiver attachment: "*[He/She] is affectionate and tender with you*", 19,926 (99.8%) responded to the question about resilience: "*[He/She] bounces back quickly when things don't go [his/her] way*", 19,946 (99.9%) responded to the question about curiosity: "*[He/She] shows interest and curiosity in learning new things*", and 19,945 (99.9%) responded to the question about positive affect: "*[He/She] smiles and laughs a lot*". Because these measures were created and validated to efficiently measure children's well-being (Lippman et al., 2014, 2011), these items have found wide use in the study of active behaviors (e.g., extracurricular activities and participation in sports), peer relationships, emotional and behavioral functioning (Moore & N. Ramirez, 2016; Odar Stough, Nabors, Merianos, & Zhang, 2015), and been further related to understanding the impact of adoption (Bramlett, Radel, & Blumberg, 2007), poverty (Ekono, Jiang, & Smith, 2016), and early aversive experiences (Balistreri, 2015).

Results from a principle components analysis indicated all four well-being items loaded onto a single factor accounting for 45.6% of the observed variability, but these variables were not combined into a composite well-being measure because the reliability of these items was relatively low ($\alpha = .57$).

Explanatory Variable: Digital Screen Limit

Caregivers also estimated the time their child was exposed to digital screens with two questions: “*On an average weekday, about how much time does [your child] usually spend with computers, cell phones, handheld video games, and other electronic devices?*” and “*On an average weekday, about how much time does [child name] usually spend in front of a TV watching TV programs, videos, or playing video games?*” Nearly all (99.9%, $n = 19,957$) caregivers responded with usable data to these questions and responses were summed to estimate daily digital screen time for each child. Children spent on average about two hours (*Median* = 2:00, *SD* = 2:08) with digital screens each day. These estimates of daily digital screen time were used to code participants in line with both 2010 and revised 2016 AAP guidance. Approximately two in five children (39.2%, $n = 7,820$) were over the older two-hour AAP guidance and about seven in ten children (69.8%, $n = 13,916$) were over the revised AAP guidance.

Control Variables

Because children’s digital screen time may be correlated with ethnicity, age, gender, household income, and caregiver education (Duch et al., 2013), these were evaluated as control measures. Such adjustments might help account for their confounding influence providing these factors are also correlated with explanatory or outcome variables in this study. Males were coded 0 ($n = 10,192$, 51.1%) and females were coded 1 ($n = 9,750$, 48.9%). Household income, based on data from each household in terms of U.S. Department of Health and Human Services

poverty, was rated on scale ranging from 1 (at or below 100% of poverty level) to 8 (above 400% of poverty level). Caregiver education was operationalized in terms of caregiver respondents' own educational attainment; Those who had not completed secondary education were coded 0 ($n = 8,643, 43.3\%$) and those who had were coded 1 ($n = 11,314, 65.7\%$). Minority ethnicity was determined from caregivers' reports about their child's race; Children who were Caucasian were coded 0 ($n = 13,849, 69.4\%$) or otherwise coded 1 ($n = 6,108, 30.6\%$).

Results

Preliminary Analyses

Because most of the variables observed did not meet the assumptions of normally distributed data, non-parametric (i.e. Kendall's Tau-b) correlation analyses evaluated the strength, direction, and significance of the relations between the observed variables (Table 1). Control variables were correlated with screen time, daily digital screen time increased monotonically as a function of age ($r_T = .077, p < .001$), was higher in non-Caucasians ($r_T = .123, p < .001$), in less affluent households ($r_T = -.140, p < .001$), male children ($r_T = -.021, p < .001$), and children whose caregivers were less educated ($r_T = -.098, p < .001$). Higher levels of digital time were very modestly related to more caregiver attachment ($r_T = .015, p = .031$) and positive affect ($r = .028, p < .001$), and lower levels of resilience ($r_T = -.030, p < .001$). Those under the 2010 AAP limit reported higher resilience ($r_T = .030, p < .001$) but lower positive affect ($r_T = -.021, p = .003$); similarly, those under the revised 2016 AAP guidance reported higher resilience ($r_T = .024, p < .001$), but lower positive affect ($r_T = -.027, p < .001$) and caregiver attachment ($r_T = -.015, p = .032$). Other links between digital screen time and well-being were not significant ($ps < .11$). Despite a number of significant links, these exploratory zero order correlations should be interpreted with caution because of the small effect sizes (all

$rs_T < .032$) and large sample size ($n = 19,935$). They likely reflect the large number of tests which did not adjust for family wise error (i.e., the false positive rate).

Effects of Digital Screen Time Limits

Eight multiple regression models evaluated the strength, direction, and statistical significance of the relations between digital screen time and psychological well-being. Table 2 presents the relations between the older AAP screen time limit (top) and revised limit (bottom). For each limit, four models regressed each of the four outcome variables onto the explanatory variable holding variability linked to the control variables constant. Because eight tests were conducted and we were working with a large sample size, we adjusted the p value threshold for rejecting the null hypothesis from .05 to .00625 in line with best practices (Holm, 1979). Those under the AAP's 2010 limit showed higher levels of resilience ($p = .009$), though lower levels of caregiver attachment ($p = .031$), but neither value was below the adjusted p value threshold. Even after adjustments, children who were under the AAP's 2016 limit showed lower levels of positive affect $B = -.026$ (95% CI $[-.040, -.012]$), $\beta = .030$, $p < .001$, $d = 0.050$.

Linear and Parabolic Effects of Digital Screen Time

Multiple regression models evaluated the linear and parabolic links relating daily digital screen time to psychological well-being, holding control variables constant (Table 3). As before, we interpreted models adjusting the p value threshold for rejecting the null hypothesis from .05 to .00625. These identified a parabolic link between screen time and attachment, $B = -.001$ (95% CI $[-.002, -.001]$), $\beta = -.048$, $p = .002$, $d = 0.045$, and both linear and parabolic relations with positive affect, $B = .011$ (95% CI $[-.005, .018]$), $\beta = .053$, $p < .001$, $d = 0.049$, and, $B = -.001$ (95% CI $[-.001, -.000]$), $\beta = -.046$, $p = .004$, $d = 0.045$, respectively.

To examine significant parabolic patterns linking daily digital screen time to caregiver attachment and positive affect, we calculated the extrema for these models, to quantify the point at which the relation between screen time shifts from positive to negative or neutral (Nelson & Simonsohn, 2014). Results, presented in Table 4, indicated the parabolic functions had inflection points at 3hr 25min for caregiver attachment and 7hr 01min for positive affect.

These pivot points were then used to evaluate the degree to which linear slopes on either side of these inflection points accounted for significant variability in well-being. To this end focused tests bifurcating the data by the local extremum for these two outcome variables (see Table 4) were conducted with an adjusted significance threshold of $p < .0125$. Results indicated significant but modest positive associations between screen time and caregiver attachment, $B = .022$ (95% CI [.010, .034]), $\beta = .029$, $p < .001$, $d = 0.058$, and positive affect, $B = .008$ (95% CI [.003, .012]), $\beta = .026$, $p < .001$, $d = 0.050$, below these thresholds. Above these thresholds, trends were not significant, suggesting media use has no incremental benefit past these inflection points.

Discussion

This study was aimed at estimating the empirical value of the older and revised guidance the AAP provides to caregivers about young children's digital screen time. Also, it was meant to deepen our understanding of the nature of the relationship between digital screen time and young children's well-being, which may be linear or parabolic (Ferguson, 2017; Przybylski & Weinstein, 2017). With some exceptions (Duch et al., 2013; Nathanson et al., 2014), most of what is known about the correlates of digital screen-time is derived from studies of older children and adolescents, and very few studies at any age test children's well-being. Our analysis of nearly 20,000 children aged two to five years revealed a number of interesting findings: Daily

digital screen use increases with age, is higher in males, non-whites, for children with less educated caregivers, and in less affluent households.

Contrary to expectations, the relations between the 2010 or the revised 2016 digital limits and well-being received no empirical support. Setting aside statistical controls, young people who engaged less than the 2010 and 2016 AAP limits showed slightly higher levels of resilience but lower levels of positive affect compared to those who did not. In more conservative models, however, which accounted for demographic and background factors identified in the existing literature (Duch et al., 2013), these very small effects were no longer statistically significant. Yet consistent with the literature, the controls – child age, gender, minority ethnicity, household income, and caregiver educational attainment – were significantly associated with daily digital screen use.

Additional analyses indicated linear and parabolic relations linking daily digital screen time and some indicators of psychological well-being. These findings conceptually replicated results reported from studies with older children, showing there may be some benefits of screen use (Ferguson, 2017; Przybylski & Weinstein, 2017). They suggested that there might be extremely small positive effects of digital engagement at levels higher than what many might assume (up to 7 hours per day for both television and computer-based media). Importantly, these findings remained significant after accounting for statistical controls.

Taken together, findings suggested that there is little or no support for harmful links between digital screen use and young children's psychological well-being. This informs an existing literature with older children and adolescents which finds mixed support for the links between screen use and well-being, with some studies showing harmful effects and others showing negligibly small and non-significant correlations indicating harm (Huang, 2010; Kraut

et al., 1998). Yet our results should be viewed in light of a wider literature which suggests there may be costs to physical health (Costigan et al., 2013) and executive functioning (Reid Chassiakos et al., 2016); it might be that screens impact these indicators of healthy development without affecting well-being, though whether these links robustly replicate is also unclear.

This study presents five areas for improvement to better understand the outcomes of children's media-based screen time. First, data tested were correlational and relations identified can say little about causality among the factors under analysis. Given screen exposure might influence other aspects of child health, a pre-registered, randomised controlled trial involving interventions with young children would better test the real-world value of this and future caregiver guidance. At the same time, a lack of correlation is compelling support for a lack of causality; and in most cases negative outcomes of screen time were absent. Where present, correlations were small ($|d| < .07$) and suggest a careful consideration is needed of what researchers consider a meaningful *minimum effect size of interest* (MEOI) (Murphy & Myors, 1999). Such benchmarks can guide media and developmental researchers in implementing equivalence testing (Lakens, 2017). In line with the data we reported here and suggestions by Ferguson (Ferguson, 2009), we propose a MEOI for screen time effects of $r = .100$ (95% CI [.090, .011]). We suggest future studies should be powered, a priori, to be sensitive ($\alpha = .01$, $1-\beta = .80$) to such effects. If they are statistically significant (i.e., $p < .05$), but they fall below this effect size threshold they should be considered by researchers as insignificant in practical terms.

Second, data were provided by caregiver respondents. Convergent evidence from observations of other adults such as teachers would inform this work and AAP recommendations (Campbell & Fiske, 1959). Further, evidence from time tracking apps (Fiegerman, 2014), experience sampling methodology (Larson, 2001; Larson & Csikszentmihalyi, 2014), and

inclusion of screen time measures in time use studies (Fisher & Tucker, 2013) would allow researchers to tease apart social and media effects when modelling the inputs for short-term shifts in well-being and psychological functioning.

Third, psychological well-being was operationalized using brief measures selected intentionally to be administered by telephone interview. Though these items have been used in past research, findings should be replicated with longer measures and broader indicators of functioning and wellness. If digital screen time influences young children, its effects might be more evident in reports of sleep quality, somatic health, or peer relationships. These are all avenues for future research that would conceptually retest and expand on the present work.

Fourth, the present study findings suggested that the social and economic environment surrounding digital screens provide an important context to study when considering the possible consequences of this activity. In the present study this was operationalized in terms of socioeconomic and demographic (gender) background, but future research can also focus on more proximal and relevant social and contextual framing for technology use. For example, AAP guidance also involves the context for screen-based media use, advising that children not have screens in their bedrooms, suggesting caregivers and children use media together, and notes that the quality of digital screen time is important. This interplay of caregiver and child factors (Lauricella, Wartella, & Rideout, 2015) is not addressed by the present work. Nor does the present work examine the nuance of content and interactional aspects of the media children encountered. Though the updated AAP guidance does not give concrete definition of high quality digital media time it remains an important topic for future study. Similarly, previous research has shown differential correlates of children's exposure to television in the foreground (through direct engagement) and background (Barr, Lauricella, Zack, & Calvert, 2010; Lapierre,

Piotrowski, & Linebarger, 2012; Natale et al., 2014). Here, we speak to engagement but in future research exposure to both should be studied in relation to well-being. Similarly, some forms of digital screen time, for example video games have lower thresholds for moderate engagement than others, suggesting that qualities of the digital activity, like immersion and cost of switching, shape the degree to which a specific form of screen time have influence (Przybylski & Weinstein, 2017).

Finally, we did not pre-register our analytic plan before analysing this data. Although we did take steps to minimise our false discovery rate by adjusting our significance thresholds, future studies measuring the well-being impacts of digital screen time should adopt a confirmatory research frame in which researcher's hypotheses, sampling, and data analysis plans are registered in advance of knowledge about the data (Munafò et al., 2017).

Closing Remarks

Whether engaged through computers, tablets, or smartphones, or televisions, digital screens, despite controversy, will remain a fixture of modern childhood (Houghton et al., 2015). Given that this digital genie cannot be put back in the bottle, it is incumbent on researchers to identify the mechanisms by and extent to which exposure to these screens might influence children. The present research aimed to do so directly. We tested AAP guidelines concerning digital media time and did not find a detectable benefit in terms of psychological well-being in a large and representative sample of young children. Our findings suggest current recommendations may need to be given additional consideration given weak or non-existing links and point to the need for robust research before we can conclude whether these digital screen-time limits may have positive consequences for young people.

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Table 1***Observed Zero-Order Correlations Between Observed Variables***

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age	--										
2. Minority Ethnicity	.018**	--									
3. Household Income	.027**	-.177**	--								
4. Gender (Female)	-.007	.007	.003	--							
5. Caregiver Edu. Attainment	-.027**	-.102**	.207**	-.010	--						
6. Digital Screen Time (Daily)	.077**	.123**	-.140**	-.021**	-.098**	--					
7. Under 2010 AAP Limit	-.078**	-.128**	.130**	.024**	.097**	-.720**	--				
8. Under 2016 AAP Limit	-.108**	-.091**	.092**	.010	.072**	-.677**	.528**	--			
9. Attachment	.009	.039**	-.005	.051**	-.019**	.015*	-.010	-.015*	--		
10. Resilience	-.035**	-.042**	.059**	.046**	.002	-.030**	.030**	.024**	.230**	--	
11. Curiosity	-.050**	.006	-.007	.049**	-.016*	-.002	.004	.011	.251**	.221**	--
12. Positive Affect	-.029**	.017*	-.037**	.022**	-.038**	.028**	-.021**	-.027**	.338**	.222**	.352**

Note. Correlation coefficients reflect non-parametric (Kendall's Tau-b) slope estimates. **Correlation significant at the 0.01 level (2-tailed), *Correlation Significant at the 0.05 level (2-tailed).

Table 2**Multiple Regression Models Evaluating Well-Being Effects of Being Under the 2010 and 2016 AAP Limits**

Guidance	Outcome	<i>B</i>	<i>SE</i>	95% CI	β	<i>p</i> *	<i>d</i>
Under 2010 AAP Limit							
	Attachment	.004	.010	[-.016, .024]	.010	.683	--
	Resilience	.035	.013	[.009, .061]	.020	.009	.038
	Curiosity	.002	.009	[-.015, .019]	.010	.786	--
	Positive affect	-.011	.007	[-.024, .003]	-.010	.127	--
Under 2016 AAP Limit							
	Attachment	-.023	.011	[-.045, -.002]	-.020	.031	.032
	Resilience	.010	.014	[-.018, .038]	.010	.467	--
	Curiosity	-.001	.009	[-.019, .017]	-.001	.915	--
	Positive affect	-.026	.007	[-.040, -.012]	-.030	< .001	.053

Notes. Observed relations were tested while controlling for variability linked to child age, gender, household income, and non-white ethnicity. CI = Confidence Interval. *Because 8 statistical tests evaluated the threshold for statistical significance has been adjusted to $p < .00625$ to account for the family wise error rate associated with conducting eight tests.

Table 3**Results of models linking mental well-being to daily digital screen engagement with adjustments for the control variables**

Outcome	Type of Effect	<i>B</i>	<i>SE</i>	95% CI	Beta	<i>p</i> *	<i>d</i>
Attachment	Linear	.008	.005	[-.001, .018]	.027	.088	--
	Quadratic	-.001	.000	[-.002, -.001]	-.048	.002	.045
Resilience	Linear	-.016	.007	[-.029, -.004]	-.040	.012	.037
	Quadratic	.001	.001	[.000, .002]	.018	.241	--
Curiosity	Linear	.006	.004	[-.002, .014]	.023	.156	--
	Quadratic	-.001	.000	[-.001, .000]	-.036	.021	.034
Positive affect	Linear	.011	.003	[.005, .018]	.053	< .001	.049
	Quadratic	-.001	.000	[-.001, .000]	-.046	.004	.043

Notes. Linear and parabolic relations were tested while controlling for variability linked to child age, gender, household income, and non-white ethnicity. CI = Confidence Interval.

*Because 8 statistical tests are evaluated the threshold for statistical significance has been adjusted to $p < .00626$ to account for the family wise error rate associated with eight tests.

Table 4**Trends in psychological well-being for engagement levels below and above the observed extrema**

Outcome and engagement level	Extremum	<i>B</i>	<i>SE</i>	95% CI	Beta	<i>p</i> *	<i>d</i>
Attachment	3 hr 25 min						
Below Extremum		.022	.006	[.010, .034]	.029	< .001	.058
Above Extremum		-.010	.005	[-.019, -.001]	-.034	.041	.067
Positive Affect	7 hr 1 min						
Below Extremum		.008	.002	[.003, .012]	.026	< .001	.050
Above Extremum		.002	.007	[-.012, .016]	.012	.777	--

Notes. Linear relations were tested while controlling for variability linked to child age, gender, household income, and non-white ethnicity. CI = Confidence Interval. *Because 4 statistical tests are evaluated the threshold for statistical significance has been adjusted to $p < .00125$ to adjust for the family wise error rate associated with conducting four tests.