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Young Adolescents' Digital Technology Use, Perceived Impairments, and Wellbeing in a Representative Sample

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Abstract

Objective.—To examine the cross-sectional associations between young adolescents' access, usage, and perceived impairments related to digital technologies and their academic, psychological, and physical wellbeing.

Study design.—2,104 adolescents (ages 10–15 years), representative of the North Carolina Public School population, completed questionnaires in 2015. Administrative educational records were linked with parental consent.

Results.—Nearly all (95%) young adolescents had Internet access, 67% owned a mobile phone, and 68% had a social media account. Mobile phone ownership was not associated with any indicators of wellbeing (math and reading test scores, school belonging, psychological distress, conduct problems, or physical health) after controlling for demographic factors. Having a social media account and frequency of social media use were only robustly associated with conduct problems (explaining ~3% of the variation in conduct problems). Despite the lack of strong associations, 91% of adolescents reported at least one perceived technology-related impairment and 29% of adolescents reported online-to-offline spillover of negative experiences. Economically disadvantaged adolescents reported similar access, but greater online-to-offline spillover and stronger associations between social media account ownership and poor psychological wellbeing compared with their more affluent peers.

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Data Statement: Descriptions of the study's measures and the syntax codes used for this manuscripts' analyses are openly available (doi: 10.17605/OSF.IO/75AZD). The raw data used for this manuscript are not openly available due to privacy restrictions set forth by the institutional ethics board. No aspects of the study were formally pre-registered.

Conclusions.—At the population level, there was little evidence that digital technology access and usage is negatively associated with young adolescents' wellbeing. Youth from economically disadvantaged families were equally likely to have access to digital technologies but were more likely than their more affluent peers to report negative online experiences. Closing the digital divide will require prioritizing equity in access, as well as in experiences and opportunities.

Keywords

mobile phone; social media; psychological distress; conduct problems; academic achievement; digital divide; economic disadvantage

Media reports are filled with warnings about the toxic effects of digital technology on nearly every aspect of adolescents' lives from depression and suicide to lack of sleep and poor academic performance.[1,2,3] This narrative that digital technology is universally harmful to youth persists despite recent reviews and rigorous large-scale analyses of adolescents demonstrating tiny to null associations between digital technology usage and wellbeing.[4,5,6]

Most prior research has adopted a population-level, or one size fits all, approach to estimating harmful or beneficial "effects" of digital technologies on young people, with assumed causal arrows flowing from digital media use to adolescents' wellbeing. In contrast, co-construction theories of new media view adolescents as active participants in online contexts and recognize the bi-directional nature of adolescents' engagement with digital technologies. Here, the expectation is that young people's online activities will strongly mirror offline behaviors and contexts.[7,8] In particular, young people with offline vulnerabilities may be more prone to engage with digital environments in ways that may negatively impact their development, whereas youth with more offline supports may benefit more from the affordances offered by new technologies.

Family socioeconomic status remains one of the most powerful influences in stratifying resources, experiences, and opportunities for young people. The growing divide between families at the bottom versus top of the income distribution has created an "opportunity gap" in offline spaces for children in the United States (US) and elsewhere.[9,10] As lower and higher income children increasingly experience different neighborhoods, schools, and other physical contexts, the concern is that this opportunity gap will replicate itself in online spaces. Traditionally, the "digital divide" has referred to the differential access to new technologies based on social, economic, educational, racial, and/or regional background.[11] This divide appears to be closing among young people in the US now that 95% of 13–17 year olds have access to a smartphone and 89% own a mobile phone.[12] However, a new type of digital divide, often referred to as digital inequality, may be emerging across socioeconomic strata.[13,14] New evidence, consistent with co-construction theory, suggests emerging differences between adolescents from lower versus higher income families in relation to the types and quantity of digital technology usage (eg, more unsupervised screen time and greater time spent passively viewing media each day), quality of online experiences (e.g., more instances of online victimization), and/or stronger associations between online activities and offline wellbeing.[15,16]

This study integrates administrative school record and survey data from a large representative US sample of young adolescents to address 3 research questions (RQs). First, what is the prevalence of digital technology usage and perceived impairments among young adolescents? We document the proportion of young adolescents (aged 10–15 years) that have Internet access, own a mobile phone, have a social media account (and frequency of usage), perceive that they have technology-related impairments, and spillover of online problems to their offline lives. Second, are access, usage, or perceived impairments with digital technologies uniquely associated with adolescents' wellbeing? We examined whether access to and usage of digital technologies and technology-related impairments were associated with adolescents' academic, psychological, and physical wellbeing, with and without including demographic and socioeconomic covariates. The 6 wellbeing indicators were derived from both self-reported and administrative data sources, which offers an advantage over prior research that has relied primarily on single informant and self-report data. Third, do youth from lower versus higher income families have different patterns of digital technology access, usage, or perceived impairments or stronger associations between digital technologies and wellbeing? In accordance with co-construction theory, our analyses move away from a "one size fits all" approach. We tested whether adolescents' access to digital technologies varied by socioeconomic status and whether economically disadvantaged (versus more affluent) adolescents had higher perceived technology-related impairment or offline spillover and/or stronger associations between digital technology use and wellbeing.

Methods

Participants (N= 2,104) were recruited by RTI International to be representative of the population of children enrolled in grades 3–6 in the North Carolina Public Schools during the 2011–2012 school year with respect to economic status, sex, and ethnicity (52% female; 52% White, 23% Black, 15% Latino/a, 10% Other). At the time of the study in 2015, participants were enrolled in grades 5–8 and ranged in age from 10 to 15 years (M_{age}=12.36, SD=1.12). Parents consented to their child's involvement in the study by phone. 97% of parents also provided consent to link to data from school administrative records, which contained standardized test scores and indicators of economic status. Adolescents assented to an online survey lasting approximately one hour and reported on their digital technology use and impairments, wellbeing, and demographic characteristics.[17,18] The university's Institutional Review Board approved all procedures (#D0396).

Measures

Family economic disadvantage (n= 2,042) was assessed based on administrative data beginning in the third grade indicating families' history of eligibility for the receipt of free or reduced lunch. Although eligibility varies with household size, cutoffs are on the order of 175% of the federal poverty level. Administrative data detailing families' economic disadvantage was available, on average, for 91.4% of possible observation years. Economic disadvantage was scored as ordinal: not disadvantaged (never eligible; 41%), intermittently disadvantaged (eligible for >0% and <100% of years; 22%), and persistently disadvantaged (always eligible; 37%).

Neighborhood income (n= 2,099) was measured as the estimated median household income in participants' neighborhood – defined as the census block-group (block-groups range from about 600 to 3,000 people) mean-centered and standardized across the sample. Data was geocoded from the American Community Survey (ACS) 5-year estimates for 2010–2014.

Digital technology usage and perceived technology-related impairments— *Access to and usage of digital technologies* (n= 2,104) was measured by questions adapted from the Pew Internet & American Life national surveys.[12,19] Adolescents identified the digital devices they personally owned (i.e., Do you have …a cell phone? a smartphone?) and had access to (i.e., Do you use the Internet, at least occasionally? Do you have a social media account?). Participants with a social media account (n= 1,411) reported on frequency of usage (e.g., How often do you use social networking sites like Facebook or Instagram? [1] Less often then every few weeks, [2] every few weeks, [3] 1–2 days per week, [4] 3–5 days per week, [5] about once per day, and [6] several times a day). The prevalence of digital technology access and usage is presented in Table 1 for the entire sample and by family economic disadvantage.

Perceived impairment (n= 2,103) was measured using six items *(*adapted from Internet addiction scales[20,21,22]). Items assessed participants' perceptions that their technology usage was negatively affecting their everyday lives (e.g., Are you short of sleep due to being on your phone or the Internet late at night? [0] Never, [1] sometimes, and [2] always), M= 0.63, SD= 0.42, α= .70. A binary marker was also created to indicate whether participants reported at least one of the six items 'sometimes' or 'always' (91%; not shown in tables).

Perceived spillover of online experiences (n= 2,104) was measured using a six-item checklist of experiences on social media that the believed resulted in offline problems (Yes/No). The scale included three spillover items about perceived problems with parents, friends, or school-related anxiety and three items about more serious perceived spillover, including, face-to-face arguments, physical fights, and getting into trouble at school (Appendix; available at www.jpeds.com). Binary measures were created to indicate at least 1 of the 6 spillover experiences (29%) and 1 or more of the 3 serious spillover experiences (15%; not shown in tables).

Adolescents' academic, psychological, and physical wellbeing—*Academic achievement* (n= 2,020) was obtained from administrative records providing the end-of-grade standardized test scores for reading and math for the 2014–2015 school year.

School belonging (n= 2,104) was assessed with the six-item Psychological Sense of School Membership[23] self-report scale of school membership (e.g., I feel like a real part of my school; People at my school are friendly to me; [0] Not at all true to [5] very true), α= 0.84.

Conduct problems (n= 2,103) were assessed using the 26-item Problem Behavior Frequency Scale[24] of behavioral aggression and violence in the last 30 days (e.g., In the last 30 days, how many times have you …skipped school; stolen something from another student; [0] Never, [1] 1–2 times, [2] 3–5 times, [3] 6–9 times, [4] 10–19 times, and [5] 20+ times). This

scale was converted into a count of reported problems (binary for each item rated >1 then summed).

Psychological distress (n=2,104) was assessed using the six-item Kessler Psychological Distress Scale[25] to measure the frequency of participants' feelings of distress over the past month (e.g., During the past 30 days… about how often did you feel worthless; about how often did feel restless or fidgety? [0] None of the time to [4] all of the time), $\alpha = 0.66$.

General physical health (n= 2,097) was assessed with an item from the Add Health General Health and Diet survey[26] (i.e., In general, how is your health? [0] Poor to [4] excellent).

Statistical analyses

All analyses were conducted in STATA 15[27]. To estimate the prevalence of technology access and use across the sample, basic descriptive statistics were used (Table 1). To show associations between each separate digital technology and each of the six different indicators of wellbeing, regression analyses were conducted in 2 steps—the zero-order associations between technology usage and wellbeing and these associations controlling for demographic and economic covariates (adolescents' age, race/ethnicity, and sex, and family and neighborhood-level economic disadvantage). To test for differences across economic disadvantage groups, overall and pairwise mean comparisons in technology access, use, and perceived impairments were conducted (Table I). To test for moderation by economic disadvantage in the associations with wellbeing, regression analyses, which controlled for demographic and neighborhood income covariates, included the interaction between family-level economic disadvantage and technology variables on adolescents' wellbeing. Family economic disadvantage was modeled as a linear ordinal variable in the moderation analyses, but split into three categorical groups (i.e., no disadvantage, intermittently, and persistently disadvantaged) for clarity in the follow-up analyses and figures. Due to low levels of missing data across all variables (0– 4% missing observations across all measures), average scores were computed for all multi-item measures with >50% of the items completed (99% of scores) and all analyses were conducted using list-wise deletion. The Benjamini–Hochberg Method[28] was used to correct for false discovery rates.

Results

As shown in Table 1, nearly all (95%) of our population representative sample of 10 to 15 year olds reported access to the Internet, 67% owned a mobile phone (85% of which were smartphones), and 68% reported having a social media account. Mobile phone ownership and social media access increased with age (Figure 1). Almost half of youth 11 or younger owned a mobile phone (48%) or had a social media account (49%) and the majority of youth 14 or older owned a mobile phone (85%) and had a social media account (85%). Adolescents perceived moderate levels of impairment ($M = 0.63$, $SD = 0.42$) with the vast majority of adolescents (91%; not shown) endorsing at least one type of impairment due to their digital technology usage. Approximately 1 in 3 adolescents reported online-to-offline spillover with 15% perceiving more serious forms of spillover (i.e., school trouble, arguments, or physical fights; not shown). As Internet access was almost universal (above

90%) across demographic subgroups, the remaining analyses focus only on mobile phone ownership, social media use, and perceived impairments.

Associations between digital technologies usage and adolescents' wellbeing

Table 2 displays four main findings from the zero-order (Step 1) and semi-partial (Step 2) standardized associations between the five types of digital technology usage and six measures of adolescents' wellbeing (reading score, math score, school belonging, conduct problems, psychological distress, and general health). First, there was a small positive association between mobile phone ownership and higher standardized reading scores (β= 0.07, P = .003) and more self-reported conduct problems (β= 0.05, p= .04). After controlling for demographic and economic factors, mobile phone ownership was not associated with any of the six measures of wellbeing (ps> .05). This pattern of results also held for smartphone ownership (57% of the sample; not displayed).

Second, having a social media account was positively associated with every outcome, except standardized reading scores, in Step 1. After controlling for potential confounding factors, only three of the six associations remained: Adolescents who reported having a social media account also had lower standardized math scores (β= −0.04, p= .046; not significant after accounting for false discovery rate[28]), reported more conduct problems (β= 0.17, p< .001), and reported higher psychological distress (β= 0.06, p= .006).

Third, among adolescents with a social media account, frequency of social media use was not associated with academic achievement or psychological distress; however, more frequent social media usage was associated with more reported conduct problems (β= 0.08, p= .006).

Fourth, as shown at the bottom of Table 2, young adolescents who perceived more technology-related impairments or spillover reported more difficulties with all six measures of wellbeing; these associations held over and above controls for economic disadvantage and demographic factors (βs ranged from −0.05 to 0.33).

Table 1 shows adolescents access to, usage of, and perceived impairments related to digital technologies separated by families' economic status. Across economic status, adolescents were equally likely to own a mobile phone (including smartphones), $\chi^2(2)$= 2.21, p= .33. Compared with their more affluent peers, persistently disadvantaged youths were more likely to have a social media account, $\chi^2(2)$= 11.69, p= .003. Intermittently disadvantaged adolescents reported greater perceived technology impairments (M= 0.68, SD= 0.44) compared with non-disadvantaged adolescents (M= 0.60, SD= 0.40), $F(2, 2038)$= 5.49, p= .004. A greater proportion of intermittently (35%) and persistently (33%) disadvantaged adolescents perceived negative online-to-offline spillover of their technology use compared with non-disadvantaged youth (22%), $\chi^2(2)$= 36.31, p< .001, including when more serious measures of online-to-offline spillover are considered, including reports of school trouble, arguments, or physical fights (18% and 19% versus 10% respectively), $\chi^2(2)$= 28.47, p< .001.

Finally, we tested whether associations between digital technology usage and wellbeing were stronger among youth from economic disadvantaged versus their more affluent peers.

There were no significant interactions between economic status and mobile phone ownership, frequency of social media use, or perceived spillover, on the six indicators of wellbeing (βs ranged from −0.05 to 0.12) after accounting for other covariates. However, with covariates, economic disadvantage moderated the strength of three associations: a) having a social media account and conduct problems ($\beta_{interaction}$= 0.11, p= .01), b) having a social media account and psychological distress ($\beta_{interaction}$= 0.15, p= .001), and c) perceived impairment and conduct problems ($\beta_{interaction}$= 0.13, p= .002). These interactions are presented in Figure 2.

Figure 2, A shows that adolescents with (versus without) a social media account exhibited higher levels of conduct problems across economic groups ($\beta_{non\text{-}disadvantaged}$= 0.13, p< .001; $\beta_{intermittent}$= 0.14, p= .006), but the strongest association was observed among persistently disadvantaged adolescents ($\beta_{persistent}$= 0.21, p< .001). Figure 2, B shows that there was no difference comparing those with versus without a social media account in psychological distress among adolescents from non-disadvantaged ($\beta_{non\text{-}disadvantaged}$< .001, p= .99) or intermittently disadvantaged ($\beta_{intermittent}$= 0.07, p= .14) families, but persistently disadvantaged adolescents had higher psychological distress when they had a social media account ($\beta_{persistent}$= 0.12, p= .002). Figure 2, C shows that across the economic groups adolescents with higher perceived impairment exhibited higher levels of conduct problems ($\beta_{non\text{-}disadvantaged}$= 0.28, p< .001; $\beta_{intermittent}$= 0.33, p< .001), but the strongest association was observed among persistently disadvantaged adolescents ($\beta_{persistent}$= 0.37, p< .001).

Discussion

This study contributes to our understanding of prevalence of, and disparities in, digital technology access, experiences, and potential effects during early adolescence in five ways. First, estimates of the prevalence and correlates of digital technology usage are provided for a large, contemporary, and representative sample of young adolescents, using both administrative academic records and self-reported measures of academic, psychological, and physical wellbeing. Similar to other national surveys[12,19], our study showed that Internet access among young adolescents in the United States is now nearly universal and that having a mobile phone or social media account increases rapidly between 10 to 15 years of age. Among the young adolescents in our sample, about two thirds owned a mobile phone and/or had a social media account. These estimates are lower than those from other national studies of adolescents (typically ages 13 to 17) likely due to the younger age of this sample (ages 10 to 15). Despite current age restrictions on most popular social media platforms, 57% of adolescents under age 13 reported having a social media account. Future research among younger children is required, as high levels ownership and engagement were present even at the youngest ages in our sample.

Second, we found small bivariate associations between digital technology usage and adolescents' wellbeing, as measured by standardized test scores and self-reported wellbeing. Economic and demographic covariates accounted for all of the initial small associations between wellbeing indicators and mobile phone ownership. Having a social media account was associated with lower standardized math test scores, higher psychological distress and more conduct problems, even after controlling for potential confounding factors. However,

among adolescents with a social media account, more frequent social media use was only consistently associated with greater conduct problems and demonstrated no robust associations with standardized test scores, school belonging, psychological distress, or general health. As in other recent cross-sectional large-scale studies of adolescents' technology usage,[5,6] there were small effect sizes for the associations between digital technologies and wellbeing that accounted for little of the variance in adolescents' wellbeing (1–3%) and with no clear directionality.

Third, nearly all adolescents (91%) reported technology-related impairments and 29% reported negative 'spillover' of experiences on social media to their offline lives. One of the most striking findings from this study is the contrast between the high levels of perceived impairment among adolescents and the lack of robust or strong associations between digital technology use and academic, psychological, and physical wellbeing. The only consistent, robust associations across all types of adolescent wellbeing was with *perceived* technology-related impairments and negative offline spillover. These findings also fit with co-construction theory[7,8] and research showing that adolescents who report more online impairments (or 'problematic' technology usage) also tend to exhibit more offline impairments.[21,29] It is unclear whether reports of perceived impairment signal real technology-related difficulties versus, for example, simply reflect the powerful narrative of digital technology use as addictive or harmful in the media and elsewhere.[1,2,3] Future multi-informant and multi-method research is required to rigorously test whether adolescents' perceptions of impairment can be detected in measurable functional impairments in wellbeing. Future longitudinal research is also needed to describe and monitor adolescents with the highest levels of perceived impairments over time to test whether digital technology usage predicts new and/or exacerbates educational and health problems.

Fourth, with respect to the traditional digital divide across the income strata, our findings suggest that gaps in access to the Internet, mobile phones, and social media have narrowed or disappeared among adolescents in the United States. Although Internet access was nearly universal across economic groups (>90%), in-depth assessments are required to understand how the quality of Internet access, such as having reliable, broadband access at home, and the scaffolding of access to reliable Internet is facilitated for young people in socioeconomically disadvantaged families, neighborhoods, and schools.

Fifth, our findings provide some evidence that a new digital divide may be emerging with respect to online problems. That is, we find that economically disadvantaged (versus not-disadvantaged) youth were more likely to report perceived technology-related impairments and spillover of online experiences to serious offline problems, such as face-to-face confrontations, physical fights, and getting into trouble at school. Although traditional economic disparities in *access* to digital technologies among adolescents are narrowing, differences in experiences and potential spillover into offline work may be emerging in their place. Although there was also some evidence that social media use may be more strongly associated with psychological distress and conduct problems among economically disadvantaged versus more affluent adolescents, caution is required in interpreting these findings as only 3 of the 30 interactions tested showed significant moderation by family economic status. Future research is required to more comprehensively test for the emergence

of a new digital divide across many demographic subtypes, contexts, and developmental periods.

Thus, at the population level, digital technology use does not appear to be strongly or reliably associated with young adolescents' wellbeing; however, youth with offline vulnerabilities, including those from lower-income households, may be at heightened risk for perceived impairments and stronger negative associations between digital technology usage and wellbeing.[30] Consistent with co-construction theory, parents and teachers should monitor youth who may already be struggling with school or health problems (e.g., lower test scores; adolescents with depression) to better understand *how* and *when* they use digital technology (e.g., distraction from schoolwork, coping with immediate stressors) .

This study also had limitations. Due to the cross-sectional, correlational nature of this study, causal interpretations cannot be made. Experimental and longitudinal multi-informant and method studies are needed to parse the unique and directional effects of social media use on wellbeing (and vice versa). Although multiple domains and sources of information on adolescent functioning were used, adolescents self-reported on their technology usage and most measures of wellbeing. Measures of technology usage (especially binary markers of access and ownership) did not allow for the classification of heavy users, usage across multiple social media sites, or tests of non-linear associations. More in-depth monitoring of online activities is needed, including records of time spent online, the timing of usage, and the content social media or text message exchanges. Additional links between online activities and academic, psychological, and physical wellbeing are needed to understand the different ways that digital technologies may influence adolescents' development, with an eye toward how digital technology usage and experiences may vary across different populations of adolescents.

Findings from this study illustrate null to small associations between young adolescents' mobile phone and social media usage and their academic performance, psychological wellbeing, and general health. Although adolescents' perceived impairments related to their digital technology usage, there was little evidence in this study, and others,[5,6] that digital technology usage is negatively impacting the wellbeing of contemporary adolescents at the population level. Youth growing up economically disadvantaged families were equally likely to have access to mobile devices but were more likely than their more affluent peers to perceive negative spillover of online experiences to problems in their offline lives (e.g., fights, trouble at school). As young people come of age in an increasingly unequal and stratified world, ensuring equity in access, experiences, and opportunities in both online and offline spaces should be prioritized.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

US	United States

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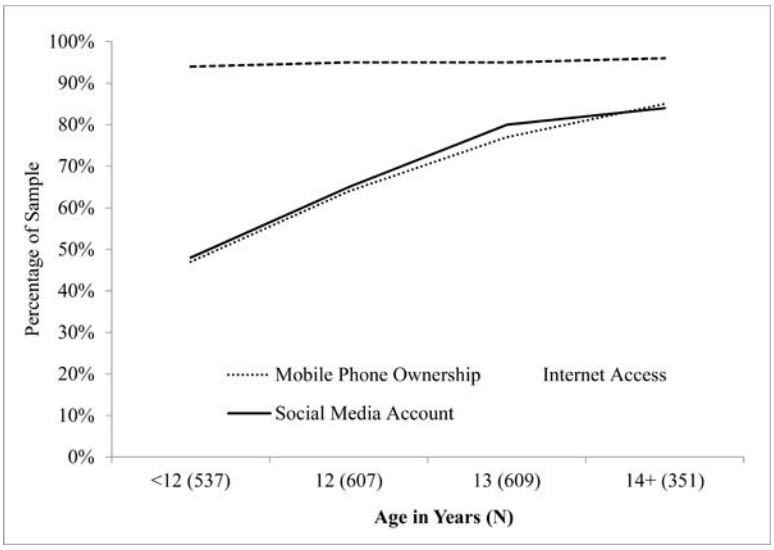

Figure 1.

Illustrates the percentage of young adolescents that had access to the Internet, owned a mobile phone, and had a social media account by age.

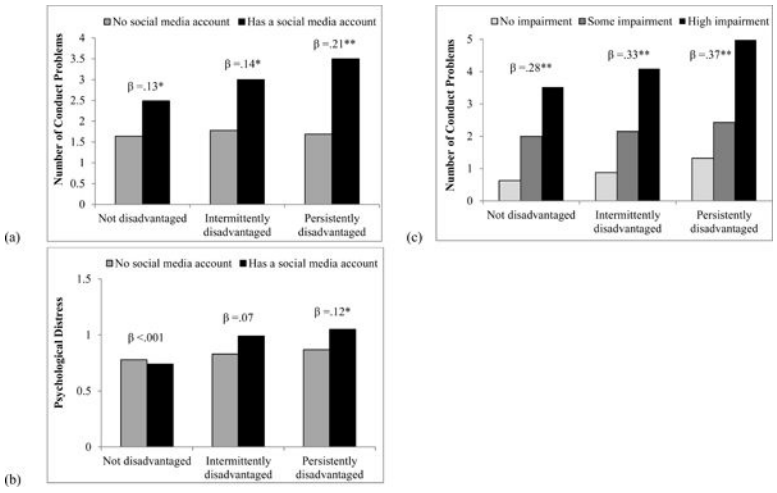

Figure 2.

Depicts the marginal means across family economic disadvantage for having a social media account and (a) conduct problems and (b) psychological distress and between perceived technology-related impairment and (c) conduct problems.

Note: All models control for adolescents' age, gender, race/ethnicity, and neighborhood income.

**p*<.01 ***p*<.001

Table 1.

Proportions or means and standard deviations of digital technology usage, perceived impairments, and wellbeing for the entire sample and by family economic disadvantage.

	Total *M* *(SD)*	Not Disadvantaged	Intermittently Disadvantaged	Persistently Disadvantaged	χ^2 / *F* (*p*-value)
N	**2,104**	**843**	**451**	**748**	
Digital Technology Usage					
Access to the Internet	0.95	0.98_a	0.94_b	0.92_b	32.72 (<.001)
Mobile phone ownership	0.67[1]	0.67	0.69	0.65	2.21 (.33)
Social media account	0.68	0.64_a	0.69_{ab}	0.71_b	11.69 (.003)
Frequency of social media use (1 to 6)	4.23 (1.70)	4.29 (1.61)	4.23 (1.70)	4.19 (1.77)	0.44 (.65)
Perceived Impairments					
Perceived technology impairment (0 to 2)	0.63 (0.42)	0.60_a (0.40)	0.69_{bc} (0.44)	0.64_{ac} (0.43)	5.49 (.004)
Perceived spillover of online experiences	0.29	0.22_a	0.35_b	0.33_b	36.31 (<.001)
Wellbeing					
Reading score	455.71 (22.31)	461.83_a (17.41)	455.26_b (10.97)	449.09_c (29.28)	254.65 (<.001)
Math score	451.91 (21.69)	458.04_a (17.10)	450.90_b (9.50)	445.62_c (28.59)	317.41 (<.001)
School belonging (1 to 5)	4.21 (0.80)	4.31_a (0.75)	4.16_b (0.79)	4.12_b (0.85)	12.49 (<.001)
Conduct problems (0 to 26)	2.54 (3.53)	2.11_a (3.02)	2.66_b (3.69)	2.97_b (3.97)	12.14 (<.001)
Psychological distress (0 to 4)	0.88 (0.61)	0.75_a (0.52)	0.95_b (0.63)	0.99_b (0.66)	34.69 (<.001)
General physical health (0 to 4)	3.11 (0.87)	3.24_a (0.81)	3.03_b (0.87)	2.99_b (0.93)	57.76 (<.001)

Note: *abc* show post-hoc differences by disadvantage for χ^2 or *F*-tests with $p < .05$ (i.e., across rows, those with same letter do not differ).

[1] 85% were smartphones.

Table 2.

Presents the standardized regression coefficients representing the 1) zero-order and 2) semi-partial associations between each type of digital technology usage and six wellbeing indicators.

	Reading Score (β)	Math Score (β)	School Belonging (β)	Conduct Problems (β)	Psychological Distress (β)	General Health (β)
Device Ownership and Usage						
Mobile Phone Ownership						
1.Mobile Phone Owner	0.07**	−0.02	−0.02	0.05*	−0.002	0.004
2.Mobile Phone Owner (adjusted)	0.001	−0.01	0.03	0.02	−0.01	−0.006
Having Social Media Account						
1.Social Media Account	0.03	−0.08***	−0.09***	0.18***	0.08***	−0.05*
2. Social Media Account (adjusted)	−0.008	−0.04*	−0.04	**0.17****	**0.06****	−0.04
Frequency of Social Media Use						
1.Frequency of SM Use	−0.007	−0.02	−0.02	0.07**	0.02	−0.003
2.Frequency of SM Use (adjusted)	−0.009	−0.02	0.02	**0.08****	0.008	−0.002
Perceived Impairment						
Perceived Tech Impairments						
1.Tech Impairments	−0.04	−0.11***	−0.29***	0.34***	0.33***	−0.17***
2.Tech Impairments (adjusted)	−0.05*	**−0.08****	**−0.27****	**0.33****	**0.33****	**−0.17****
Perceived Offline Spillover						
1.Offline Spillover	−0.08**	−0.15***	−0.25***	0.33***	0.27***	−0.13***
2.Offline Spillover (adjusted)	**−0.06****	**−0.08****	**−0.24****	**0.32****	**0.26****	**−0.12****

Note. Regression models were conducted separately for each type of digital technology and wellbeing variable. Step 2 controls for adolescents' age, race/ethnicity, gender, and family and neighborhood-level economic disadvantage.

* $p < .05$

** $p < .01$

*** $p < .001$.

Bold shows the significant adjusted coefficients after false discovery rate correction.[27]