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Gaming and social media browsing: Evidence of links to wellbeing among girls and boys based on data from PISA 2022

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Abstract:
Using data from the Programme for International Student Assessment (PISA) 2022, this article examines how time spent browsing social media and gaming relates to seven aspects of adolescent wellbeing: school belonging, body image, general wellbeing, feeling of safety, life satisfaction, psychosomatic symptoms, and stress resilience. Descriptive statistics and regression modelling were used to examine these associations. To evaluate their practical significance, we also calculated relative risks and compared the correlation coefficients with those between being bullied and wellbeing. Firstly, we found that psychosomatic symptoms, such as anxiety, sleep difficulties, and headaches, showed a consistently negative association with time spent browsing social media, even after controlling for student background characteristics. The strength of this correlation was equivalent to 63 per cent of that between bullying and psychosomatic symptoms among girls and 48 per cent among boys. Adolescents who browsed for more than three hours daily were about 50 per cent more likely to fall within the top quartile experiencing psychosomatic symptoms compared to same-gender peers who browsed less. Negative associations were observed with time spent gaming, though to a lesser extent. Secondly, browsing social media for more than three hours a day increased the likelihood of scoring in the lowest quartile for body image, wellbeing, and life satisfaction by about 20 per cent for girls, but not for boys. Lastly, while some positive links were found between social media browsing and sense of school belonging, these instances were rare, and their strength was outweighed by the negative associations with other wellbeing aspects.

Gaming and social media browsing: Evidence of links to wellbeing among girls and boys based on data from PISA 2022

Carmen H. J. Lim (Research Division) **and Pia Kreijkes** (Research Division)

Introduction

Adolescent wellbeing is on a declining trajectory. Adolescents today are less satisfied with their life compared to adolescents two decades ago. This decline in life satisfaction was reported in the 2024 World Happiness Report among young people aged 15 to 24 in regions such as Western Europe, South Asia, Middle East and North Africa, and North America, Australia and New Zealand (Marquez et al., 2024). Similarly, when asked about their happiness in five life aspects, adolescents aged 10 to 15 in the United Kingdom (UK) reported being least happy with their appearance, school and schoolwork, followed by friends and family – all of which were on a falling trend over the past decade (The Children's Society, 2025).

Feeling emotionally well and being able to function effectively are essential for adolescents to thrive in school and beyond. Adolescents who struggle emotionally or functionally may skip school more often, lose focus in class, or show less interest in learning (Gutman & Vorhaus, 2012). Prolonged periods of low wellbeing can also increase the risk of developing mental health conditions, such as clinical depression (World Health Organization, 2025). These occurrences negatively affect adolescents' learning and academic performance, preventing them from reaching their full potential (Kaya & Erdem, 2021).

There are a multitude of factors that may cause low wellbeing among adolescents. These include financial challenges, lack of family support and friends, or being bullied at school, as reported by UK adolescents in the 2025 *Good Childhood Report* (The Children's Society, 2025). The report also concluded that heavy social media use can have a detrimental effect on adolescents' wellbeing.

Parents and policymakers are concerned about adolescents' exposure to harmful content and cyberbullying on social media and other online platforms, as well as the impact this has on their wellbeing. These concerns have prompted ongoing efforts to tighten regulations aimed at improving online safety for children and adolescents, such as the enactment of the Online Safety Act in the UK in 2023.[1]

1 For more, see https://www.legislation.gov.uk/ukpga/2023/50.

Furthermore, discussions and proposals to raise the minimum age for social media use beyond 13 years are gaining momentum globally, with Australia having legislated a ban for users under 16 and Denmark for those under 15 (Keaten, 2025).

The focus on social media in these debates is perhaps not ungrounded, considering that adolescents spend a significant amount of time on social media platforms. A study tracking detailed smartphone usage among adolescents aged 11 to 17 in the United States (US) found that social media applications were used the most each day, followed by YouTube and gaming (Radesky et al., 2023). Another survey of US adolescents indicated that they spent an average of about 2.9 hours daily on social media and an additional 1.9 hours on YouTube, totalling 4.8 hours across both activities (Rothwell, 2023). This represents roughly one-third of a 16-hour waking day.

One concern about adolescents spending such a high number of hours on their smartphones (or other digital devices) is that it may come at the expense of time spent on other beneficial activities, such as exercising, in-person play, and reading. Another concern is that heavy users are more likely to develop problematic behaviours and addiction-like symptoms, such as an inability to control usage. The Health Behaviour in School-aged Children (HBSC) study by the World Health Organization found that more than one in ten adolescents showed signs of problematic social media use or problematic gaming behaviour (Boniel-Nissim et al., 2024). Interestingly, the same study showed that more girls exhibited signs of problematic social media use than boys (13 per cent versus 9 per cent), whereas more boys showed signs of problematic gaming behaviours (16 per cent versus 7 per cent).

Various studies have highlighted differences in usage patterns between girls and boys, as well as potentially varying effects on their wellbeing. According to the HBSC study, at least 40 per cent of boys reported daily gaming, while this ranged from 15 per cent to 25 per cent for girls, depending on age. By contrast, more girls, older girls in particular, reported being in contact with friends and others through social media almost all the time throughout the day (Boniel-Nissim et al., 2024). Research also found that girls are more at risk of the negative impacts of social media use, particularly of experiences of depressive symptoms, anxiety and internalising problems (Fumagalli et al., 2024; Svensson et al., 2022). Girls also tend to be impacted at an earlier age than boys (Orben et al., 2022).

However, when examining the literature on digital use and adolescent wellbeing more broadly, researchers conclude that the findings appear mixed and inconsistent (Valkenburg et al., 2022). Some key issues contributing to these inconsistencies are that many studies do not analyse results by gender and are not specific about the measures of digital use, e.g., some consider screen time, while others look at specific digital media activities (Svensson et al., 2022).

Additionally, wellbeing is a multifaceted concept and does not have a single agreed-upon definition (McLellan & Steward, 2015). Different studies have used different indicators to measure adolescent wellbeing, such as general satisfaction with their life, experiences of positive and negative affect, and occurrences of

mental health symptoms (Fumagalli et al., 2024). If social media use or gaming impacts each of these aspects differently, this could explain why findings to date appear mixed or inconsistent. The first aim of this article, therefore, is to examine how time spent on social media and gaming relates to different aspects of wellbeing, for both boys and girls.

Another debate in the literature is whether any negative impacts of social media use, and more generally online screen time, are practically significant (Pearson, 2025). Meta-analyses generally conclude that the link between social media use and wellbeing is "weak", although a few described the same associations as "substantial" (Valkenburg et al., 2022). One potential reason for these differences in interpretation is that effect size guidelines are inherently "arbitrary", as Cohen (1988) noted when introducing the now widely used correlation coefficient guidelines. Cohen foreshadowed the current debate on how strong a correlation between social media use and wellbeing must be to be considered practically significant, emphasising that this would depend on context. Specifically, Cohen (1988, p. 13) stated:

> "Many effects sought in personality, social, and clinical-psychological research are likely to be small effects as here defined ... Large effects are frequently at issue in such fields as sociology, economics, and experimental and physiological psychology, fields characterized by the study of potent variables or the presence of good experimental control or both."

Some researchers have therefore urged caution against gauging the practical significance of this issue solely based on conventional effect size guidelines used in the field. Instead, they recommend considering more meaningful measures of impact, such as relative risk (Twenge & Hamilton, 2022), which compares the risks of an undesirable outcome occurring between two groups of individuals. Twenge and Hamilton (2022) illustrated the importance of this using an example: while the correlation between smoking and lung cancer was about $r = 0.06$, which is considered "small" by conventional guidelines, the relative risk indicated that smokers were 30 times more likely to develop lung cancer than non-smokers.

The second aim of this article is therefore to examine the relationship between social media use or gaming and adolescent wellbeing, not only using correlation coefficients but also relative risk, to provide a more practical understanding of the potential impacts.

Data

The Programme for International Student Assessment (PISA)[2] provides a valuable source of data for examining the relationship between time spent on social media or gaming and different aspects of wellbeing. PISA is a large-scale international assessment of 15-year-olds, conducted every three years by the Organisation for Economic Co-operation and Development (OECD) since 2000. PISA 2022,

2 The PISA dataset was accessed from the OECD website (https://www.oecd.org/en/data/datasets/pisa-2022-database.html) and analysed following the recommended best practice guidelines (OECD, 2009). The data was fully de-identified (i.e., no student-level identifiers were included), and no results were presented that could rank or evaluate individual schools or students.

the latest survey cycle at the time of writing, is particularly relevant here as it included two optional questionnaires of interest: a wellbeing questionnaire and an Information and Communication Technology (ICT) familiarity questionnaire.

The wellbeing questionnaire provides detailed measures of adolescent wellbeing beyond the routinely asked life satisfaction question, such as frequency of feeling nervous or depressed and the degree to which they agree that they like their appearance just as it is. The ICT questionnaire records, among other things, the availability of digital devices in schools, frequency of using digital devices inside and outside of school, and the frequency of use for specific purposes, such as gaming or browsing social media which is a key piece of information for our analyses.

Therefore, our analyses only focused on countries that administered **both** these optional questionnaires. Table 1 presents the number of sampled students from each of the 10 analysed countries.

Table 1: The number of students sampled in each analysed country

Country	Abbreviated country name	Number of PISA students (unweighted)	Percentage of total sample
Brazil	BRA	10 798	12.3%
Costa Rica	CRI	6 113	6.9%
Hong Kong (China)	HKG	5 907	6.7%
Hungary	HUN	6 198	7.0%
Ireland	IRL	5 569	6.3%
Macao (China)	MAC	4 384	5.0%
Panama	PAN	4 544	5.2%
Saudi Arabia	SAU	6 928	7.9%
Slovenia	SVN	6 721	7.6%
Spain	ESP	30 800	35.0%
Total		**87 962**	**100%**

Although nearly half of the students were from Spain and Brazil, survey weights (known as senate weights in PISA data) were applied to ensure each country contributes roughly[3] equally to the results. Doing so avoids the results being skewed by countries with large numbers of students but instead produces an approximately equal average across all countries.

Social media use and gaming

In the PISA 2022 questionnaire, students were asked how much time they spent browsing "social networks" and playing "video-games (using ... [a] smartphone, a gaming console or an online platform or Apps)" on a typical weekday and

3 The use of senate weights limits each country's contribution to an equivalent of 5 000 observations in the analyses. However, missing data in certain variables can reduce the total weights for some countries, slightly affecting the equality of the average across countries. That said, there are no cases where the results are dominated by a small handful of countries.

weekend day, separately. The exact wording of these PISA questions did not differentiate between usage inside or outside of school, so it is reasonable to assume this reflects students' overall daily use.

Instead of reporting the number of hours, students selected one of six options:

1. No time at all
2. Less than one hour a day
3. Between one and three hours a day
4. More than three hours and up to five hours a day
5. More than five hours and up to seven hours a day
6. More than seven hours a day

In this dataset, 46 per cent of girls spent more than three hours per day browsing social media on weekends and 40 per cent on weekdays. Among boys, the figures were 32 per cent on weekdays and 37 per cent on weekends. Notably, nearly 1 in 4 girls (24 per cent) reported spending more than five hours browsing social media on a typical weekend day.

For gaming, the pattern was reversed between girls and boys. Among boys, 46 per cent reported gaming for more than three hours per day on weekends, dropping to 34 per cent on weekdays. For girls, the figures were much lower: 18 per cent on weekdays and 26 per cent on weekends. Similar to the pattern observed for girls on social media browsing, nearly 1 in 4 boys reported gaming for five hours or more on a weekend day. These observations align with other studies showing that girls tend to spend more time on social media, while boys spend more time gaming.

Wellbeing

The PISA 2022 data included multiple variables, each created by combining student responses to several related questions, designed to measure various aspects of wellbeing. To determine which variables can be considered indicative of adolescent wellbeing, we used the conceptual framework proposed by McLellan and Steward (2015). The authors proposed four aspects of wellbeing for children and adolescents' wellbeing in the school context:

1. Interpersonal wellbeing (e.g., feeling cared for and treated fairly)
2. Life satisfaction
3. Perceived competence (e.g., feeling good about oneself and believing one is doing well)
4. Negative emotion (e.g., feeling worried)

We reviewed the PISA wellbeing questionnaire and identified seven variables that can represent one or more of these aspects. These are life satisfaction, body image perception, general wellbeing on a typical day, sense of belonging at school, feeling of safety, the ability to resist stress, and frequency of experiencing psychosomatic symptoms. The descriptions of these wellbeing variables and their corresponding variable names in the PISA data are presented in Table 2.

Table 2: Wellbeing variables analysed

PISA variable name	Short description	Long description
BELONG	Sense of belonging at school	Students' responses to six statements about feeling like an outsider, making friends easily, belonging at school, feeling awkward or out of place, being liked by peers, and feeling lonely.
BODYIMA	Body image perception	Students' agreement with statements about liking their body, how clothes fit, their appearance, attractiveness, and concerns about weight.
EXPWB	General wellbeing on a typical day	Students' reports of experiencing six positive events the day before the survey: laughing a lot, learning something interesting, having enough energy, being treated with respect, satisfaction with time use, and feeling accomplished.
FEELSAFE	Feeling of safety	Students' reports of feeling of safety in classrooms, other school areas, and on their way to and from school.
LIFESAT	Life satisfaction	Students' satisfaction across 10 areas: health, appearance, learning at school, friends, neighbours, possessions, relationships with parents and teachers, use of time, and school life.
PSYCHSYM	Frequency of experiencing psychosomatic symptoms	Students' ratings of the frequency of nine symptoms related to mind (feeling depressed, irritable, nervous, anxious) and body (headache, stomach pain, back pain, difficulty sleeping, dizziness).
STRESAGR	Ability to resist stress	Students' self-assessment on 10 statements about handling stress, such as getting nervous easily, working under pressure, and worrying about many things.

These wellbeing variables are constructed by the OECD, using Item Response Theory based on student responses to multiple items. Consequently, the values are in logit units, and their interpretation is not straightforward. A score of 0 corresponds to the OECD average for the variable, while scores of +1 and –1 represent one standard deviation above and below this average, respectively. For all but one variable presented in Table 2, higher scores indicate higher levels of wellbeing. The one exception is the frequency of psychosomatic symptoms, for which higher scores indicate lower levels of wellbeing (for more details, see, OECD, 2024[4]).

Not all respondents have data for each wellbeing variable. The amount of missing data varies by variable, mostly because some countries did not administer certain wellbeing questions. For example, respondents from Costa Rica have no data on body image perception (BODYIMA) and life satisfaction (LIFESAT). The variable measuring students' general wellbeing (EXPWB) had the highest level of missing data, mainly from Brazil, Panama, and Saudi Arabia. This is partly because responses from students who answered "no" to the question "Was yesterday a typical day?" were excluded when constructing this variable, as it is intended to reflect wellbeing on a representative day.

4 Specifically, Chapter 19.

Table 3 shows the mean wellbeing scores for boys and girls, along with the standard errors of these estimates. On average, girls report lower wellbeing than boys across all variables. Girls' mean scores fall below the OECD average for variables where higher values indicate greater wellbeing (all except PSYCHSYM) but are above the OECD average in the frequency of psychosomatic symptoms (PSYCHSYM).

Table 3: Summary statistics for wellbeing scores by gender

Wellbeing variable	Mean score			Standard error around the mean estimate	
	Girls	Boys	Difference (girls-boys)	Girls	Boys
BELONG	-0.15	-0.02	-0.13	0.006	0.006
BODYIMA	-0.25	0.01	-0.26	0.009	0.007
EXPWB	-0.08	0.13	-0.21	0.008	0.007
FEELSAFE	-0.22	0.03	-0.25	0.008	0.007
LIFESAT	-0.12	0.05	-0.17	0.008	0.009
PSYCHSYM	0.24	-0.35	0.59	0.006	0.007
STRESAGR	-0.33	0.26	-0.59	0.007	0.007

Methods

Descriptive statistics

We began the analysis by examining the mean wellbeing scores by students' time spent on social media and gaming, separately for girls and boys. This is a straightforward way to assess whether more time spent on these activities is associated with lower wellbeing. We then calculated Spearman's correlation coefficients to quantify the strength of these relationships.[5] For comparison, we also calculated the correlation coefficients between frequency of being bullied[6] and wellbeing, as it is reasonable to expect that wellbeing would be affected by whether students are bullied. Doing so helps us interpret the effect sizes for time spent on digital activities in relation to a factor more widely recognised as having a substantial impact on wellbeing. This supports the second aim of this article to provide a clearer understanding of the practical significance of these associations.

For this and all other analyses in this article, senate weights were applied to ensure roughly equal contributions from each country, and replicate weights (as provided in the PISA dataset but readjusted to ensure each country is equally

5 Spearman's correlation was used instead of the Pearson's correlation because the time use variable is ordinal (e.g., zero hours, less than one hour, ..., more than seven hours). The calculations were performed in R using the *intsvy* (Caro & Biecek, 2017) and *wCorr* (Bailey et al., 2023) R packages.

6 This data was collected by PISA and readily available in the dataset.

weighted)[7] were used to account for sampling variance when calculating standard errors.

Relative risk

To better understand the relationships between time spent browsing social media and gaming and the different aspects of wellbeing in practical terms, we calculated the relative risk of being in the bottom 25 per cent[8] of wellbeing scores within each gender group, comparing adolescents (i) who browsed social media for more than three hours daily with (ii) those who browsed for three hours or less. These relative risks were calculated separately for girls and boys and for each wellbeing variable. We did the same calculation for gaming, comparing adolescents who gamed for more than three hours daily with those who gamed for fewer hours.

There is no consensus on the optimal amount of time for gaming or social media use, so any threshold dividing students into two groups for relative risk calculations is necessarily arbitrary. Previous studies have used different threshold values: for example, Twenge et al. (2020) compared those spending two or more hours on the internet with those spending less than two, and also contrasted very heavy users (over seven hours) with light users (30 minutes to one hour). Similarly, Twenge et al. (2018) examined relative risks between three or more hours of electronic device use versus less than three.

Our threshold choice is guided by Zablotsky (2025), who defined high "non-schoolwork screen time" as four or more hours per day and found that adolescents in this group were more likely to experience adverse health outcomes such as depression and anxiety. Since the definition of "screen time" in that study likely included time spent beyond social media browsing and gaming, we considered the "more than three hours and up to five hours" category in our data to be the most appropriate threshold here.

A relative risk of 1 means both groups are equally likely to be in the bottom 25 per cent of wellbeing scores. Values above 1 indicate a higher likelihood for those spending more than three hours, while values below 1 indicate a lower likelihood compared to those spending less time. For easier interpretation, the score for psychosomatic symptoms (PSYCHSYM) was reversed for this analysis, so a relative risk greater than 1 indicates a higher likelihood of being in the bottom quartile group that experiences these symptoms most frequently.

Regression analysis

To assess the relationship between time spent browsing social media or gaming and wellbeing, while controlling for student background characteristics, we conducted multivariate regression analyses estimated using Ordinary Least Squares. For each wellbeing outcome, two models were fitted:

7 Since the Balanced Repeated Replication (BRR) weights in the PISA dataset assign larger total weights to countries with bigger populations, we scaled the replicate weights so that each country had the same total weight within each set of replicate weights. This was achieved by applying a constant factor to each observation within a country, bringing its total weight to 5 000, while maintaining relative differences between observations. These adjustments were applied to all sets of replicate weights and used in all analyses.

8 This was calculated using weighted percentile using the wtd.quantile() R function from the *Hmisc* package (Harrell Jr, 2024).

1. **Model 1**: Includes all control variables and the time spent browsing social media or gaming on weekends and weekdays, separately.

2. **Model 2**: Builds on Model 1 by adding four interaction terms: the interaction between time spent browsing social media or gaming during weekends and gender, and the interaction between time spent browsing social media or gaming during weekdays and gender.

Model 1 estimates the association between browsing social media and wellbeing, and between gaming and wellbeing for all students, while controlling for students' background characteristics. Model 2 explores whether these associations differ by gender through interaction effects.

The models included the following control variables:[9]

- **student characteristics**: age, grade, gender, academic performance as approximated by student math performance in PISA, whether they have recently skipped classes;
- **socioeconomic and family environment**: economic, social, and cultural status index (ESCS), family support, frequency of doing paid work and household duties;
- **interpersonal relationships**: days spent with friends, number of close friends, relationships with teachers, frequency of being bullied;
- **physical health indicators**: exercise frequency, body mass index; and
- **school background**: student–teacher ratio, computer–student ratio, school type, negative school climate.

Our regression estimates are likely to be conservative due to potential overcontrolling. To estimate a direct effect closer to causal, that is, how wellbeing changes with increases in time spent browsing social media or gaming, the regression models controlled for factors related to both wellbeing and time spent browsing social media or gaming, such as exercise frequency, days spent with friends, and frequency of doing paid work (as shown in the preceding list). However, if time spent on digital activities replaces in-person activities beneficial for wellbeing (time displacement theory, see Moy et al., 1999; Putnam, 2000), then our results may have underestimated the total impact of digital use on wellbeing as indirect effects are not fully captured here.

For all regression analyses, we applied a stricter significance level than the conventional 5 per cent due to the large number of hypotheses tested. As such, we only considered an effect to be statistically significant when $p \leq 0.01$. The mathematical specification for both models, including expanded descriptions of the control variables, can be found in Table A1 in the Appendix.

9 Data for these control variables was obtained from both the student and school PISA datasets. The student dataset includes responses from the student questionnaire as well as other questionnaires, such as the wellbeing and ICT familiarity questionnaires. The school dataset consists of responses provided by school principals through the school questionnaire.

Results

Descriptive statistics

Figure 1 shows the mean wellbeing scores by students' time spent browsing social media or gaming, presented separately for girls and boys. Solid dots represent means based on weekend usage, while hollow dots represent weekday usage. However, given that means for weekday and weekend usage were very similar, these dots largely overlap in the graphs.

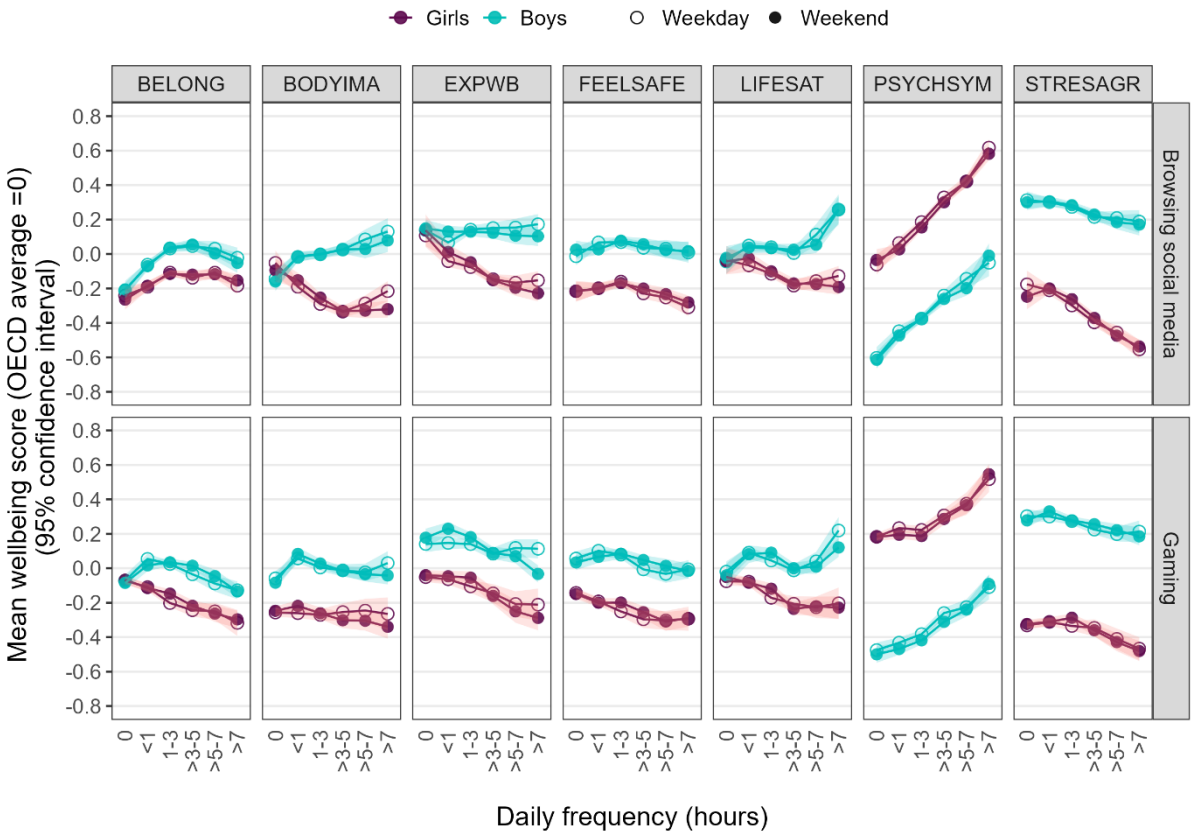

Figure 1: Mean wellbeing scores (with 95 per cent confidence interval) by time spent on social media or gaming during a typical weekday and weekend day, for girls and boys

The first observation from the figure is that relationships between time spent on social media or gaming and mean wellbeing scores varied across wellbeing variables. The wellbeing aspect that was most visibly negatively linked to time spent on these uses was the frequency of experiencing psychosomatic symptoms (PSYCHSYM), that is, those who spent longer browsing social media or gaming experienced psychosomatic symptoms more often. Students who spent over seven hours browsing social media or gaming reported PSYCHSYM scores that were, on average, about 0.5 logits higher than those spending less than one hour. This magnitude of difference was observed for both girls and boys. In contrast, a positive association to wellbeing, though smaller, was observed for sense of belonging at school (BELONG). For example, girls who browsed for more than one hour daily, on average, reported higher BELONG than girls who browsed less or not at all.

The second observation is that there were several cases where the relationship differed between girls and boys. Girls who spent more time browsing social media, on average, reported lower body image perception, lower general wellbeing, lower stress resistance, and, to a smaller extent, lower life satisfaction. In contrast, these mean wellbeing scores remained relatively similar among boys regardless of their usage or only slightly declined as time spent browsing social media increased. Boys who spent more than seven hours browsing social media had a noticeably higher average life satisfaction score than those who spent fewer hours browsing, but the reason for this is unclear. For the relationships between time spent gaming and wellbeing, there were fewer wellbeing variables that showed a clear gender difference.

Figure 2 shows the correlation coefficients for these relationships based on time spent during weekends, with correlations between frequency of being bullied and wellbeing included for comparison. Results based on weekday usage are very similar and, hence, are not presented here.

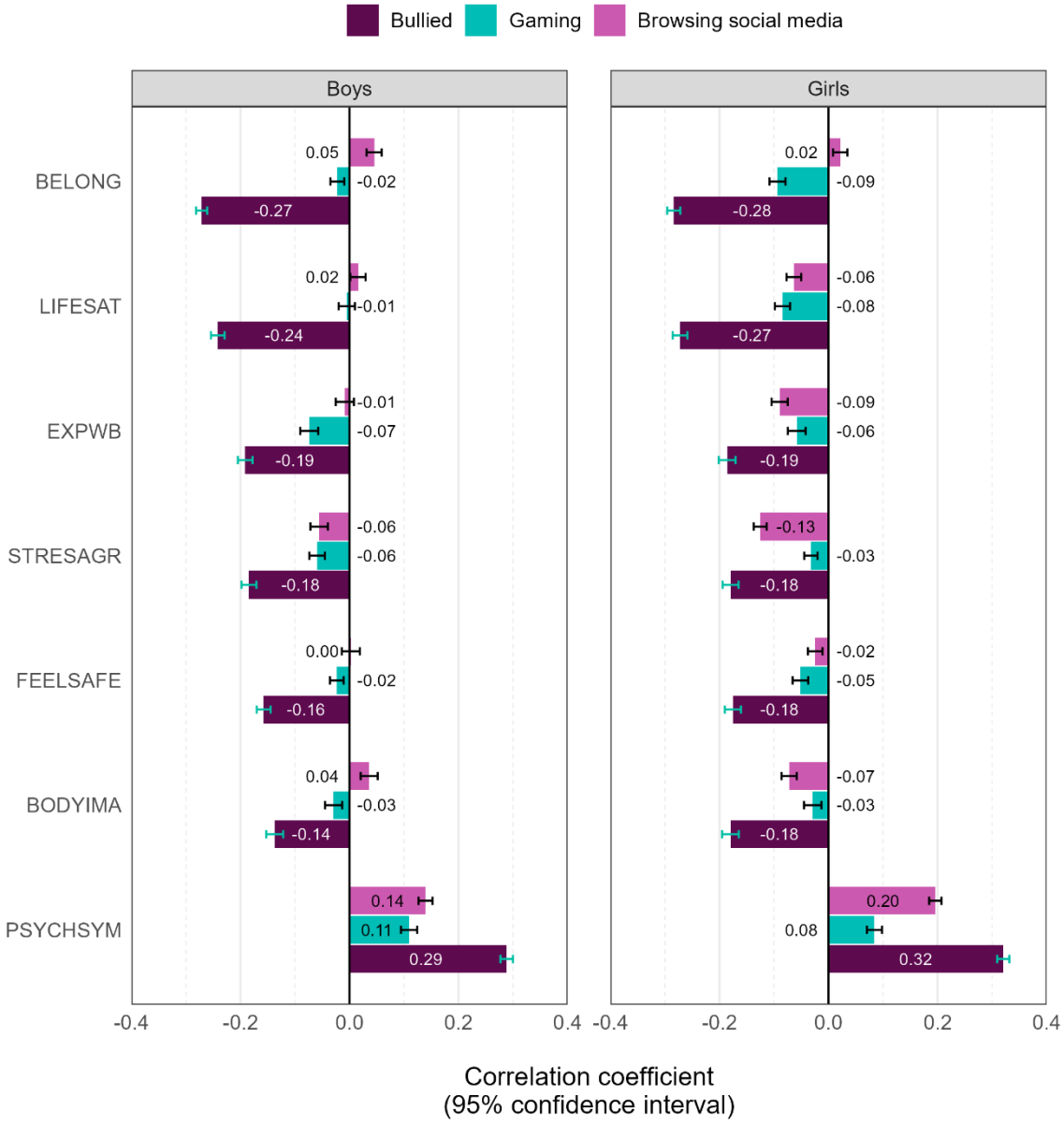

Figure 2: Spearman's rank correlation coefficients between wellbeing scores and (i) time spent on social media or gaming on a typical weekend day, and (ii) frequency of being bullied

As shown in the figure, for girls, the strongest correlation was between time spent browsing social media and frequency of psychosomatic symptoms (r = 0.20), which was about 63 per cent of the correlation between frequency of being bullied and psychosomatic symptoms (r = 0.32). The second strongest correlation was between time spent browsing social media and the ability to resist stress (r = -0.13), about 70 per cent of the correlation between being bullied and stress resistance (r = -0.18). For gaming, the correlations were smaller, ranging (in absolute terms) from 0.03 to 0.09 depending on the wellbeing variable.

For boys, the two strongest correlations were between psychosomatic symptoms and browsing social media (r = 0.14) and between psychosomatic symptoms and gaming (r = 0.11), corresponding to about 48 per cent and 38 per cent of the correlation between psychosomatic symptoms and being bullied, respectively.

Relative risk

When comparing the risk of having a wellbeing score in the lowest quartile (i.e., bottom 25 per cent) between students who spent more than three hours and those who spent less time, a similar pattern emerges, as shown in Figure 3: (i) the level of relative risk varies by the wellbeing outcome considered, and (ii) some gender differences were evident.

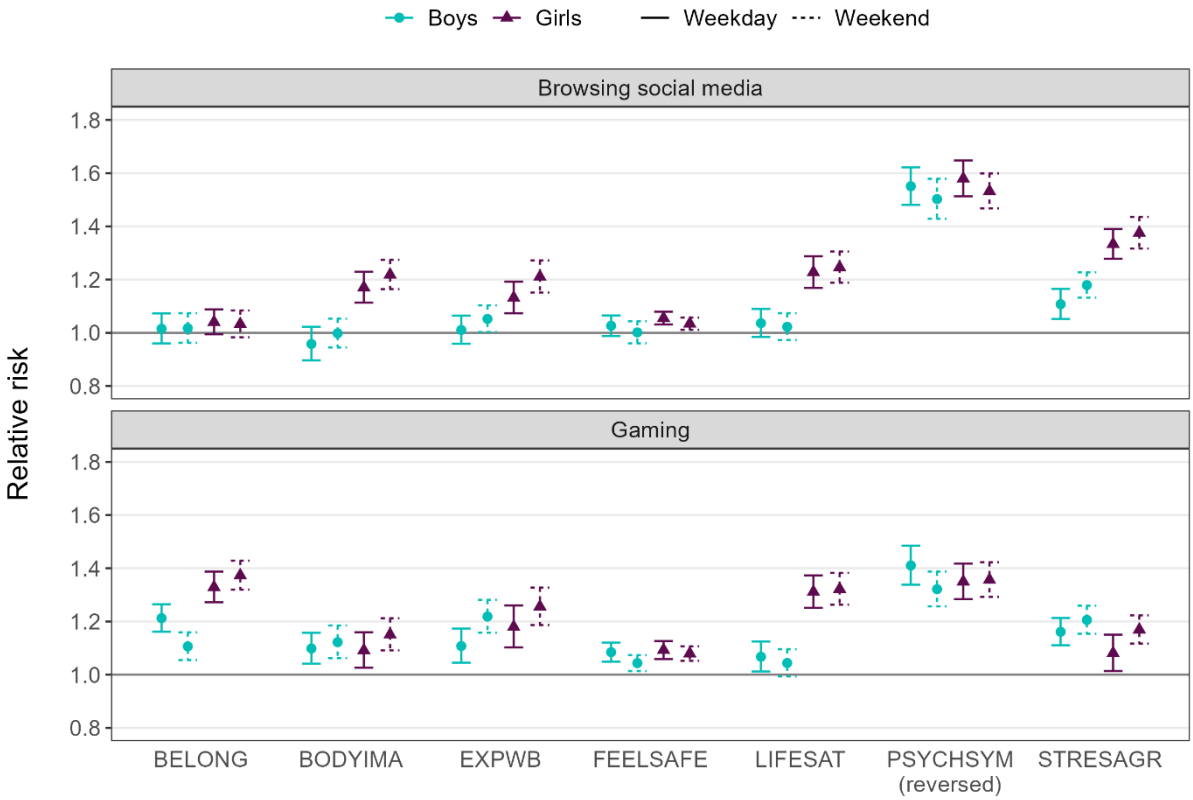

Figure 3: Relative risk of being in the bottom 25 per cent of wellbeing scores (within each gender) for students spending more than three hours daily browsing social media or gaming compared to those spending less

Girls who browsed social media for more than three hours per day were about 20 per cent more likely (i.e., relative risk value of around 1.2) to have body image perception, general wellbeing, and life satisfaction scores in the lowest quartile compared to girls who browsed less. They were also about 30 per cent more likely to fall into the lowest quartile for stress resistance and at least 50 per cent more likely to do so for psychosomatic symptoms. In contrast, this pattern was not observed among boys. Boys were generally equally likely to be in the lowest quartile for all wellbeing variables, except for psychosomatic symptoms. For psychosomatic symptoms, boys who browsed for more than three hours were about 50 per cent more likely to be in the lowest quartile than boys who browsed less or not at all.

Relative risks for gaming were generally lower than for browsing social media. Among girls, the highest relative risks for gaming were observed for sense of belonging, life satisfaction, and psychosomatic symptoms. Girls who gamed for more than three hours were about 30 per cent more likely to be in the lowest quartile for these wellbeing variables compared to girls who gamed less or not at all. For boys, the highest relative risk was again for psychosomatic symptoms, where those who gamed for more than three hours were at least 30 per cent more likely to be in the lowest quartile than those who gamed less.

Regression analysis

Table 4 presents the key estimated regression coefficients from Model 1, which shows the associations between time spent gaming or browsing social media (separately for weekend and weekday) and each wellbeing outcome for all students overall. Similarly, Table 5 presents results from Model 2, which shows whether these associations vary by gender. Full regression outputs from both models are available in the Supplementary Materials.

Overall, even after controlling for observable characteristics and background variables, the patterns observed earlier remained evident.

Firstly, as shown in Table 4, greater time spent browsing social media was statistically significantly associated with a higher frequency of psychosomatic symptoms, with a difference of approximately 0.30 logits[10] between those browsing more than seven hours daily and non-browsers. Time spent gaming, specifically during weekends, was also associated with higher frequency of psychosomatic symptoms but to a much lesser extent compared to browsing social media.

Secondly, increased time spent browsing social media was associated with lower stress resistance. For instance, compared to non-browsers, those who browsed more than seven hours per day had stress resistance scores that were 0.15–0.18 logits lower, depending on whether usage occurred on a weekday or weekend day. These relationships did not differ significantly by gender (see the interaction terms in Table 5), and the same negative association was not found in time spent gaming.

10 This was calculated by multiplying the estimated coefficient for browsing social media by the difference in numeric category between those who spent seven or more hours per day (coded as six) and those who spent no time on this activity (coded as one), i.e., 0.06 logits × (6 – 1) = 0.06 × 5 = 0.30 logits.

Thirdly, positive associations were observed primarily between a sense of belonging at school and time spent browsing social media. For instance, students who browsed for more than seven hours daily were estimated to have belonging scores that were 0.11 logits higher than those of non-browsers, controlling for their background characteristics (or 0.09 logits higher compared to those browsing for less than one hour). These magnitudes were noticeably smaller than the negative associations observed. This relationship did not differ significantly between girls and boys (see the interaction terms in Table 5).

Fourthly, the associations between gaming and wellbeing are different to the associations between browsing social media and wellbeing in two cases: increased time spent gaming on weekdays is associated with lower sense of belonging at school and positively associated with body image perception. These relationships did not differ significantly between girls and boys (see the interaction terms in Table 5).

Lastly, results from Table 5 indicate that the associations between time spent gaming and browsing social media and wellbeing differed statistically between girls and boys for body image perception, general wellbeing, and life satisfaction. These gender differences are indicated by the interaction terms (e.g., "Browsing SM (Weekday) * Boys"). To ease the interpretation of these differences, Figure 4 illustrates the predicted wellbeing scores for variables with statistically significant gender interaction terms.[11] As shown in the figure, more time spent browsing social media on weekends was negatively associated with body image perception, for girls but not boys. Furthermore, while general wellbeing is expected to be lower for those who spent more time browsing social media on weekends, the decline in general wellbeing as time spent increases was estimated to be much larger for girls than for boys. For life satisfaction, neither browsing social media nor gaming showed a statistically significant overall association (see Table 4). However, the association differed by gender, where boys' life satisfaction tended to be higher with more time spent browsing social media or gaming, whereas girls' life satisfaction tended to decline instead (Figure 4).

11 Figure 4 presents the predicted wellbeing scores for students with a specific set of background characteristics. However, the overall relationships between time spent gaming or browsing social media and wellbeing are expected to be the same for students with different background profiles. The only difference lies in the level of the predicted scores, which may be higher or lower depending on the students' characteristics.

Table 4: Key estimated coefficients from regression Model 1

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
(Intercept)	-0.309 (0.238)	-1.148 (0.326) **	0.540 (0.321)	-0.956 (0.305) *	0.226 (0.310)	-0.418 (0.275)	-1.067 (0.294) **
Boys	0.107 (0.009) **	0.219 (0.012) **	0.169 (0.012) **	0.229 (0.011) **	0.127 (0.014) **	-0.542 (0.011) **	0.495 (0.011) **
Browsing SM (Weekday)	0.022 (0.005) **	0.008 (0.007)	-0.000 (0.007)	0.011 (0.006)	-0.004 (0.006)	0.060 (0.006) **	-0.029 (0.005) **
Browsing SM (Weekend)	0.022 (0.005) **	-0.017 (0.006) *	-0.033 (0.006) **	0.000 (0.006)	0.000 (0.006)	0.056 (0.005) **	-0.035 (0.005) **
Gaming (Weekday)	-0.020 (0.005) **	0.020 (0.005) **	0.004 (0.006)	-0.013 (0.006)	0.010 (0.006)	-0.003 (0.005)	0.012 (0.006)
Gaming (Weekend)	-0.009 (0.005)	0.001 (0.004)	-0.023 (0.005) **	-0.003 (0.005)	0.009 (0.005)	0.024 (0.005) **	-0.001 (0.005)
R-squared	0.199 (0.004)	0.149 (0.004)	0.180 (0.004)	0.124 (0.004)	0.224 (0.004)	0.214 (0.003)	0.159 (0.004)
Weighted count	38 895	32 933	29 260	34 973	34 874	38 799	32 353

Notes: Digital usage variables were coded as numeric values from 1 (0 hours), 2 (< 1 hour), ... , to 6 (> 7 hours). "SM" denotes social media. Regression coefficients significant at p values ≤ 0.001 are indicated by **, and * for those at $p \leq 0.01$. Standard errors (in parentheses) were estimated using Balanced Repeated Replication weights, which were adjusted to ensure equal country representation. The linear model included country fixed effects and a set of student, family, and school characteristics. The full outputs are available in the Supplementary Materials.

Table 5: Key estimated coefficients from regression Model 2

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
(Intercept)	-0.269 (0.235)	-1.045 (0.324) **	0.626 (0.321)	-0.937 (0.305) *	0.342 (0.305)	-0.423 (0.274)	-0.992 (0.299) **
Boys	0.035 (0.025)	0.026 (0.033)	0.022 (0.030)	0.197 (0.029) **	-0.088 (0.034) *	-0.541 (0.029) **	0.377 (0.032) **
Browsing SM (Weekday)	0.013 (0.007)	0.005 (0.009)	-0.007 (0.009)	0.010 (0.008)	0.000 (0.008)	0.061 (0.008) **	-0.040 (0.008) **
Browsing SM (Weekend)	0.022 (0.007) **	-0.042 (0.009) **	-0.050 (0.009) **	-0.005 (0.007)	-0.018 (0.007)	0.063 (0.007) **	-0.048 (0.006) **
Gaming (Weekday)	-0.024 (0.007) **	0.022 (0.008) *	-0.011 (0.008)	-0.015 (0.008)	-0.009 (0.008)	-0.005 (0.007)	0.020 (0.008) *
Gaming (Weekend)	-0.008 (0.006)	-0.001 (0.008)	-0.009 (0.008)	0.001 (0.007)	0.005 (0.006)	0.018 (0.006) *	-0.002 (0.007)
Browsing SM (Weekday) * Boys	0.020 (0.011)	0.008 (0.012)	0.014 (0.013)	0.003 (0.012)	-0.009 (0.013)	-0.003 (0.012)	0.023 (0.012)
Browsing SM (Weekend) * Boys	-0.001 (0.010)	0.055 (0.012) **	0.037 (0.014) *	0.012 (0.012)	0.034 (0.011) *	-0.016 (0.009)	0.028 (0.011)
Gaming (Weekday) * Boys	0.006 (0.009)	-0.007 (0.012)	0.024 (0.012)	0.003 (0.011)	0.033 (0.011) *	0.006 (0.010)	-0.019 (0.011)
Gaming (Weekend) * Boys	-0.000 (0.009)	0.002 (0.012)	-0.028 (0.012)	-0.009 (0.010)	0.011 (0.010)	0.014 (0.009)	0.000 (0.011)
R-squared	0.199 (0.004)	0.151 (0.004)	0.181 (0.004)	0.124 (0.004)	0.226 (0.004)	0.214 (0.003)	0.160 (0.003)
Weighted count	38 895	32 933	29 260	34 973	34 874	38 799	32 353

Notes: Digital usage variables were coded as numeric values from 1 (0 hours), 2 (< 1 hour), ... , to 6 (> 7 hours). "SM" denotes social media. Regression coefficients significant at p values ≤ 0.001 are indicated by **, and * for those at $p \leq 0.01$ Standard errors (in parentheses) were estimated using Balanced Repeated Replication weights, which were adjusted to ensure equal country representation. The linear model included country fixed effects and a set of student, family, and school characteristics. The full outputs are available in the Supplementary Materials.

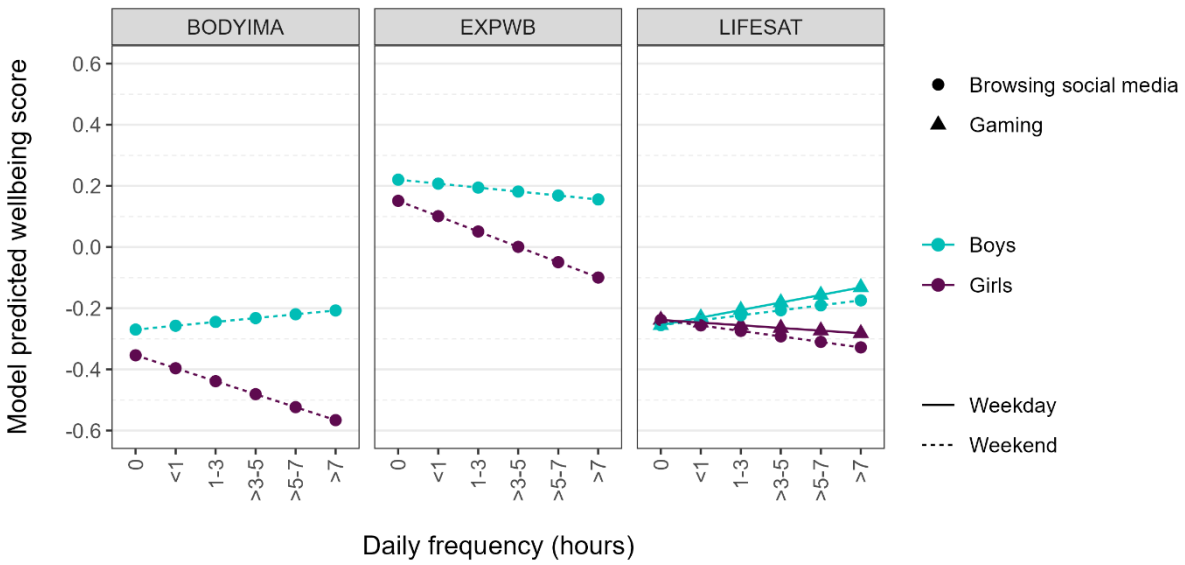

Figure 4: Predicted wellbeing scores by gender based on Model 2. Predictions were for 15-year-old students from group 5 of Economic, Social and Cultural Status, with medium levels of family support, number of close friends, quality of relationship with teachers, frequency of bullying, and body mass index. Students were in grade 10, not skipping classes two weeks prior to the PISA test, not working outside of school, spending two days per week with friends after school, not exercising, from Ireland, studying in a public school with medium student–teacher ratio, computer–student ratio, negative school climate, and a plausible math score of 450.

Discussion and conclusion

Using data from PISA 2022, this article first aimed to examine the relationship between time spent browsing social media or gaming and various aspects of adolescent wellbeing. The intention was to shed light on the mixed findings in the existing literature by exploring whether differing definitions and conceptualisations of wellbeing could have contributed to this heterogeneity. The second aim was to investigate the practical significance of these relationships by going beyond simple correlation coefficients, which are commonly used in research based on cross-sectional data. This aim was motivated by the ongoing debate about whether the correlations found in research of this kind hold any practical significance. This has implications for policy decisions on whether and which measures are likely to be effective in protecting adolescent wellbeing, which is on a declining trajectory.

Across seven aspects of adolescent wellbeing, we found that both the direction and strength of associations to social media browsing and gaming varied depending on the specific wellbeing aspect considered. The biggest negative association observed was between time spent browsing social media and the frequency of psychosomatic symptoms, such as headaches and anxiety. Similar associations were observed for both girls and boys, and the patterns held even after controlling for students' background characteristics. For example, the correlation between social media browsing and psychosomatic symptoms was about 63 per cent of the correlation between being bullied and psychosomatic symptoms for girls, and about 48 per cent for boys. Adolescents who browsed for

more than three hours a day were about 50 per cent more likely to fall within the top quartile experiencing the most frequent psychosomatic symptoms, compared to their peers of the same gender. Time spent gaming also had the same link with psychosomatic symptoms, but to a lesser extent. A consistent, though weaker, negative association was also found for stress resistance. For example, girls who spent three or more hours browsing social media were about 30 per cent more likely to be in the bottom 25 per cent for stress resistance than girls who spent less time.

Evidence of positive associations was mainly observed for students' sense of belonging at school. Those who engaged in light browsing (one to three hours per day) reported a higher sense of belonging compared to peers who browsed less or not at all. However, sense of belonging declined as browsing time exceeded three hours per day. This may explain why, when examining relative risks, students who spent more than three hours browsing were not significantly more likely to have low belonging scores (in the lowest quartile) than those who browsed less. These positive associations were more noticeable after controlling for student background characteristics. Nevertheless, the magnitude of the negative associations with psychosomatic symptoms or stress resistance outweighed the positive association with sense of belonging.

The variations in the type and strength of associations highlight the need to clearly define specific wellbeing outcomes in future research, particularly for meta-analyses that synthesise findings across diverse studies. Moreover, users of research should also understand that not all aspects of adolescent wellbeing are equally vulnerable to the effects of social media browsing and gaming.

Furthermore, we also found that the associations between time spent gaming or browsing social media and wellbeing differed between girls and boys, particularly for body image perception, general wellbeing, and life satisfaction. Girls who browsed social media for more than three hours per day were about 20 per cent more likely to score in the lowest quartile for these measures compared to girls who browsed less. Similarly, girls who gamed for more than three hours were 30 per cent more likely to have life satisfaction scores in the lowest quartile. These patterns were not observed among boys, and the gender differences remained even after controlling for student background characteristics. This finding highlights the necessity for future studies to examine gender-specific associations or impact and the need for policymakers to develop targeted measures that address the challenges faced by girls in the digital world.

Limitations

As with any study based on cross-sectional and non-experimental data, the associations reported in this article cannot be interpreted as causal. Firstly, the analysis relies on self-reported measures of wellbeing and time spent browsing social media and gaming, which are susceptible to inaccuracies. Secondly, it is possible that time spent on these activities and wellbeing influence each other simultaneously. Consequently, for example, the observed positive association between sense of belonging at school and social media browsing may partly reflect that students with more friends are more likely to browse social media.

Furthermore, as noted in the Methods section, our regression estimates may have underestimated the total impact of time spent on browsing social media or gaming on wellbeing because we controlled for factors such as exercise frequency and time spent with friends. As a result, our model does not capture any indirect effects on adolescents' wellbeing that may occur through the displacement of beneficial in-person activities.

Lastly, while we found a negative association between time spent gaming and browsing social media and adolescents' experience of psychosomatic symptoms, we were unable to determine whether these associations were driven primarily by physical symptoms which are potentially linked to sedentary behaviour, or by mental symptoms, which may relate to the experiences of online interactions and content exposure. This limitation arises because the wellbeing measure used here was a composite that combines both physical and mental aspects. Future research should examine these dimensions separately, as doing so could help identify which interventions are most likely to be effective in addressing adolescent experience of psychosomatic symptoms.

References

Bailey, P., Sikali, E., Emad, A., & Buehler, E. (2023). wCorr: Weighted correlations (R package version 1.9.8) [Computer software].

Boniel-Nissim, M., Marino, C., Galeotti, T., Blinka, L., Ozoliņa, K., Craig, W., Lahti, H., Wong, S. L., Brown, J., Wilson, M., Inchley, J., & van den Eijnde, R. (2024). A focus on adolescent social media use and gaming in Europe, central Asia and Canada. Health Behaviour in School-aged Children international report from the 2021/2022 survey (Vol. 6). WHO Regional Office for Europe.

Caro, D. H., & Biecek, P. (2017). intsvy: An R package for analyzing international large-scale assessment data. *Journal of Statistical Software, 81*(7), 1–44.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Fumagalli, E., Shrum, L. J., & Lowrey, T. M. (2024). The effects of social media consumption on adolescent psychological wellbeing. *Journal of the Association for Consumer Research, 9*(2), 119–130.

Harrell Jr, F. E. (2024). *Hmisc: Harrell miscellaneous*. (R package version 5.2-1) [Computer software].

Gutman, L. M., & Vorhaus, J. (2012). *The impact of pupil behaviour and wellbeing on educational outcomes*. The Childhood Wellbeing Research Centre.

Jerrim, J., Lopez-Agudo, L. A., & Marcenaro-Gutierrez, O. D. (2022). The impact of test language on PISA scores. New evidence from Wales. *British Educational Research Journal, 48*(3), 420–445.

Kaya, M., & Erdem, C. (2021). Students' well-being and academic achievement: A meta-analysis study. *Child Indicators Research, 14*(5), 1743–1767.

Keaten, J. (2025, November 8). Another country agrees to ban social media for children under 15. *Independent*.

Marquez, J., Taylor, L., Boyle, L., Zhou, W., & De Neve, J.-E. (2024). Child and adolescent wellbeing: Global trends, challenges and opportunities. In J. F. Helliwell, R. Layard, J. D. Sachs, J.-E. De Neve, L. B. Aknin, & S. Wang (Eds.), *World Happiness Report 2024* (pp. 61–102). Wellbeing Research Centre, University of Oxford.

McLellan, R., & Steward, S. (2015). Measuring children and young people's wellbeing in the school context. *Cambridge Journal of Education, 45*(3), 307–332.

Moy, P., Scheufele, D. A., & Holbert, R. L. (1999). Television use and social capital: Testing Putnam's time displacement hypothesis. *Mass Communication and Society, 2*(1–2), 27–45.

OECD. (2009). PISA data analysis manual: SAS (2nd ed.). OECD Publishing.

OECD. (2024). *PISA 2022 technical report*. OECD Publishing.

Orben, A., Przybylski, A. K., Blakemore, S.-J., & Kievit, R. A. (2022). Windows of developmental sensitivity to social media. *Nature Communications, 13*(1), 1649.

Pearson, H. (2025, April 2). Do smartphones and social media really harm teens' mental health? *Nature*.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community.* Simon and Schuster.

Radesky, J., Weeks, H. M., Schaller, A., Robb, M., Mann, S., & Lenhart, A. (2023). *Constant companion: A week in the life of a young person's smartphone use*. Common Sense Media.

Rothwell, J. (2023, October 13). Teens spend average of 4.8 hours on social media per day. *Gallup*.

Svensson, R., Johnson, B., & Olsson, A. (2022). Does gender matter? The association between different digital media activities and adolescent well-being. *BMC Public Health, 22,* 273.

The Children's Society. (2025). *The Good Childhood Report 2025.*

Twenge, J. M., Haidt, J., Joiner, T. E., & Campbell, W. K. (2020). Underestimating digital media harm. *Nature Human Behaviour, 4,* 346–348.

Twenge, J. M., & Hamilton, J. L. (2022). Linear correlation is insufficient as the sole measure of associations: The case of technology use and mental health. *Acta Psychologica, 229,* 103696.

Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2018). Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. *Clinical Psychological Science, 6*(1), 3–17.

Valkenburg, P. M., Meier, A., & Beyens, I. (2022). Social media use and its impact on adolescent mental health: An umbrella review of the evidence. *Current Opinion in Psychology, 44,* 58–68.

World Health Organization. (2025, August 29). *Depressive disorder (depression).*

Zablotsky, B., Ng, A. E., Black, L. I., Haile, G., Bose, J., Jones, J. R., & Blumberg, S. J. (2025). Associations between screen time use and health outcomes among US teenagers. *Preventing Chronic Disease, 22,* E38.

Appendix

Specification of the regression models

The mathematical specification of the regression Model 2 is as follows:

$$w_{isc} = \beta_0 + \boldsymbol{\beta_1}(\boldsymbol{D_{isc}}) + \boldsymbol{\beta_2}(\boldsymbol{D_{isc}} * G_{isc}) + \boldsymbol{\beta_3 X_{isc}} + \beta_4 G_{isc} + \boldsymbol{\theta_c} + \varepsilon_{isc}$$

where i denotes student, s indexes school and c indexes country. The variable w_{isc} represents the wellbeing of student i from school s in country c.

$\boldsymbol{D_{isc}}$ is the set of variables indicating time spent browsing social media or gaming (henceforth, digital usage variables), and $\boldsymbol{\beta_1}$ represents the effects of digital usage on students' wellbeing, averaged across countries.

G_{isc} is the gender variable (1 = boys, 0 = girls), and $\boldsymbol{D_{isc}} * G_{isc}$ represents the gender interaction terms. The coefficients of interest here are $\boldsymbol{\beta_2}$ which capture whether the association between time spent browsing social media or gaming varies by gender.

$\boldsymbol{X_{isc}}$ denotes the vector of control variables (see Table A1 for full descriptions and coding; the gender and country terms were only included once). The term $\boldsymbol{\theta_c}$ indicates the country fixed effect to account for unobserved country characteristics (e.g., country's wealth). Lastly, the term ε_{isc} is the error term representing factors not captured in the model that affect w_{isc}.

Model 1 has a similar specification to Model 2, but it excludes the gender interaction term $\boldsymbol{\beta_2}(\boldsymbol{D_{isc}} * G_{isc})$. The coefficients of interest in Model 1 are therefore $\boldsymbol{\beta_1}$ which indicate whether the digital usage is a significant predictor of wellbeing.

Although we did not use a multilevel model, which is common in educational research, our approach accounts for some of the hierarchical structure of the data through the use of Balanced Repeated Replication (BRR) weights, country fixed effects, and school-level variables. As noted by OECD (2009), "while simple linear regression models do not recognise hierarchical structure of data, it is possible to account for some hierarchical aspects of the PISA data [...] in the linear regression by using BRR weights [...] These models can adjust for clustering of students within schools and other aspects of survey design" (p. 229). This approach was also used in prior research (e.g., Jerrim et al., 2022).

All regression analyses were conducted using the *intsvy* R package (Caro & Biecek, 2017).

Description of control variables

Table A1: Description of control variables included in the regression models

Regression variable name	PISA variable name	Description	Variable values*
BRA	CNT	Country name – Brazil	1 = Brazil, 0 if otherwise
CRI	CNT	Country name – Costa Rica	1 = Costa Rica, 0 if otherwise
HKG	CNT	Country name – Hong Kong	1 = Hong Kong, 0 if otherwise
HUN	CNT	Country name – Hungary	1 = Hungary, 0 if otherwise
IRL	CNT	Country name – Ireland	1 = Ireland, 0 if otherwise
MAC	CNT	Country name – Macao	1 = Macao, 0 if otherwise
PAN	CNT	Country name – Panama	1 = Panama, 0 if otherwise
SAU	CNT	Country name – Saudi Arabia	1 = Saudi Arabia, 0 if otherwise
SVN	CNT	Country name – Slovenia	1 = Slovenia, 0 if otherwise
ESP	CNT	Country name – Spain	1 = Spain, 0 if otherwise
AGE	AGE	Student age	Continuous
Grade	ST001D01T	International grade	Grade 7, grade 8, ..., grade 12 and ungraded
Ability	PV1MATH–PV10MATH	Student mathematics performance as a proxy for their academic performance. The variable PV1MATH is used in main analyses while others are for sensitivity checks.	Continuous
ESCSG	ESCS	Index of economic, social and cultural status as a proxy for family wealth. This variable is derived in the dataset based on highest parental occupation status, highest parental education, and home possessions.	1 = lowest status and wealth, ... , 10 = highest, and Missing
FAMSUPG	FAMSUP	Family support frequency based on students' rating of the frequency someone in their family engaged in activities with them outside of school.	High, Medium, Low, Missing
SKIP	SKIPPING	An indicator on whether the student had skipped classes in the two weeks before the survey.	Skipped, No skip, Missing
Gender	ST004D01T	Gender	1 = boys, and 0 = girls
WORKP	WORKPAY	Number of times students worked for pay outside of school in a typical week.	0 = none, 1 = once per week, ..., 10 = ten or more, Missing
WORKH	WORKHOME	Number of times students worked in the household or cared for a family member outside of school in a typical week.	0 = none, 1 = once per week, ..., 10 = ten or more, Missing
DFREN	WB158Q01HA	Number of days spent with friends after school.	0 = 0 days, ..., 6 = 6 days, Missing

Regression variable name	PISA variable name	Description	Variable values*
NFREN	WB156Q01HA	Number of close friends.	High, Medium, Low, Missing
RELATSTG	RELATST	Quality of relationship with teachers.	High, Medium, Low, Missing
BULLIEDG	BULLIED	Frequency of being bullied in the past 12 months.	High, Medium, Low, Missing
EXER	EXERPRAC	Number of times students exercised in a typical week.	0 = none, 1 = once per week, ..., 10 = ten or more, Missing
BMIG	STUBMI	Body mass index. This variable was only used in the model where body image perception was the outcome variable.	High, Medium, Low, Missing
STRATIOG	STRATIO	Student–teacher ratio as a proxy for school resources.	High, Medium, Low, Missing
SCHTYPEG	SCHLTYPE	School type as classified by PISA based on school type and sources of funding reported by school principals.	Private independent, Private government dependent, Public, Missing
NEGSCH	NEGSCLIM	Negative school climate. The extent of behavioural issues contributing to negative climate in the school the student was studying in at time of survey.	Severe, Medium, Low, Missing
CSRATIOG	RATCMP1	Computer–student ratio as a proxy for school resources.	High, Medium, Low, Missing

*Variables categorised as High, Medium, and Low (or Severe, Medium, and Low) were created by dividing students into three equally sized groups (unweighted) based on their values for the respective PISA variable. The High category includes students with higher values, and the Low category includes those with lower values. To avoid dropping a large amount of data from the regression models, an additional Missing category was created for many variables. Similarly, ESCS values were divided into 10 equally sized groups to form the ESCSG variable.

Supplementary Materials for:

Lim, C. H. J., & Kreijkes, P. (2026). Gaming and social media browsing: Evidence of links to wellbeing among girls and boys based on data from PISA 2022. *Research Matters: A Cambridge University Press & Assessment publication, 41*, 9–31. https://doi.org/10.17863/CAM.127730

Table S1: Full output from seven regression models using the specification from Model 1

Variable	Dependent variable						
	BELONG	**BODYIMA**	**EXPWB**	**FEELSAFE**	**LIFESAT**	**PSYCHSYM**	**STRESAGR**
(Intercept)	-0.309 (0.238)	-1.148 (0.326) **	0.540 (0.321)	-0.956 (0.305) *	0.226 (0.310)	-0.418 (0.275)	-1.067 (0.294) **
AGE	-0.025 (0.015)	0.025 (0.019)	0.001 (0.019)	0.031 (0.018)	-0.028 (0.019)	0.016 (0.015)	0.025 (0.017)
BMIG Low (ref: High)		0.354 (0.012) **					
BMIG Medium		0.293 (0.013) **					
BMIG Missing		0.045 (0.021)					
BULLIEDG Low (ref: High)	0.383 (0.009) **	0.235 (0.012) **	0.298 (0.013) **	0.177 (0.012) **	0.331 (0.010) **	-0.490 (0.010) **	0.284 (0.012) **
BULLIEDG Medium	0.217 (0.010) **	0.119 (0.016) **	0.139 (0.015) **	0.134 (0.013) **	0.136 (0.014) **	-0.254 (0.013) **	0.163 (0.014) **
BULLIEDG Missing	0.005 (0.122)	0.296 (0.104) *	0.011 (0.130)	-0.043 (0.134)	-0.028 (0.129)	-0.113 (0.113)	0.123 (0.082)
Country CRI (ref: BRA)	0.018 (0.061)		-0.128 (0.088)	0.242 (0.088) *		0.517 (0.097) **	0.045 (0.068)
Country ESP	0.284 (0.033) **	0.098 (0.045)	-0.443 (0.036) **		0.189 (0.043) **	0.062 (0.035)	-0.005 (0.029)
Country HKG	-0.277 (0.024) **	-0.068 (0.031)	-0.009 (0.037)	0.042 (0.037)	-0.018 (0.032)	-0.114 (0.035) **	-0.066 (0.028)
Country HUN	0.153 (0.025) **	-0.128 (0.032) **	-0.109 (0.031) **	0.114 (0.031) **	0.057 (0.026)	0.281 (0.029) **	0.102 (0.026) **
Country IRL	-0.141 (0.032) **	-0.029 (0.049)	-0.066 (0.048)	0.174 (0.053) **	0.103 (0.044)	0.046 (0.042)	-0.024 (0.041)
Country MAC	-0.197 (0.096)	0.021 (0.094)	-0.191 (0.099)	-0.229 (0.095)	0.088 (0.098)	0.108 (0.097)	-0.236 (0.087) *
Country PAN	-0.051 (0.028)	0.292 (0.031) **	-0.208 (0.034) **	0.340 (0.034) **	0.175 (0.032) **	0.071 (0.033)	
Country SAU	0.120 (0.022) **	0.571 (0.038) **	0.058 (0.026)	0.318 (0.029) **	0.790 (0.029) **	-0.058 (0.026)	
Country SVN	0.088 (0.024) **	-0.056 (0.032)	-0.301 (0.029) **	0.255 (0.034) **	0.129 (0.025) **	-0.081 (0.025) **	-0.067 (0.021) *
CSRATIOG Low (ref: High)	-0.005 (0.016)	-0.024 (0.019)	-0.020 (0.020)	-0.027 (0.019)	-0.005 (0.019)	0.022 (0.017)	-0.033 (0.016)
CSRATIOG Medium	0.008 (0.012)	0.016 (0.015)	-0.007 (0.017)	0.000 (0.017)	0.001 (0.015)	0.005 (0.015)	-0.003 (0.013)
CSRATIOG Missing	0.022 (0.029)	0.027 (0.034)	-0.048 (0.034)	0.002 (0.035)	0.022 (0.037)	0.015 (0.030)	0.041 (0.029)
DFREN 1 (ref: 0)	0.162 (0.011) **	0.069 (0.020) **	0.133 (0.023) **	0.087 (0.019) **	0.094 (0.016) **	-0.090 (0.018) **	0.048 (0.018) *
DFREN 2	0.225 (0.013) **	0.109 (0.020) **	0.222 (0.019) **	0.085 (0.018) **	0.131 (0.017) **	-0.117 (0.016) **	0.094 (0.017) **
DFREN 3	0.267 (0.014) **	0.141 (0.018) **	0.241 (0.024) **	0.089 (0.021) **	0.149 (0.017) **	-0.130 (0.015) **	0.138 (0.019) **
DFREN 4	0.258 (0.016) **	0.169 (0.020) **	0.286 (0.023) **	0.095 (0.020) **	0.145 (0.020) **	-0.144 (0.019) **	0.144 (0.018) **

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
DFREN 5	0.299 (0.015) **	0.189 (0.018) **	0.323 (0.021) **	0.103 (0.020) **	0.204 (0.016) **	-0.172 (0.020) **	0.147 (0.018) **
DFREN 6	0.307 (0.017) **	0.209 (0.023) **	0.331 (0.025) **	0.173 (0.018) **	0.221 (0.021) **	-0.135 (0.021) **	0.134 (0.024) **
DFREN Missing	0.184 (0.033) **	0.141 (0.058)	0.182 (0.067) *	0.054 (0.049)	0.079 (0.069)	-0.081 (0.060)	0.048 (0.039)
ESCSG 2 (ref: 1)	0.019 (0.021)	0.037 (0.023)	-0.021 (0.027)	-0.034 (0.026)	0.031 (0.024)	0.032 (0.023)	0.019 (0.021)
ESCSG 3	0.016 (0.019)	0.027 (0.023)	-0.025 (0.023)	-0.024 (0.026)	0.014 (0.024)	0.062 (0.024)	-0.009 (0.020)
ESCSG 4	0.028 (0.020)	0.032 (0.023)	-0.027 (0.022)	-0.025 (0.025)	0.022 (0.022)	0.073 (0.021) **	0.029 (0.022)
ESCSG 5	0.053 (0.022)	0.059 (0.022) *	-0.027 (0.027)	-0.008 (0.028)	0.051 (0.024)	0.052 (0.023)	0.024 (0.024)
ESCSG 6	0.051 (0.018) *	0.033 (0.026)	-0.027 (0.024)	-0.004 (0.027)	0.040 (0.023)	0.110 (0.022) **	0.001 (0.026)
ESCSG 7	0.052 (0.020)	0.074 (0.023) **	-0.035 (0.028)	-0.003 (0.025)	0.058 (0.028)	0.079 (0.024) **	0.007 (0.024)
ESCSG 8	0.089 (0.021) **	0.064 (0.025)	-0.043 (0.029)	0.065 (0.027)	0.083 (0.026) **	0.119 (0.023) **	0.000 (0.025)
ESCSG 9	0.104 (0.022) **	0.088 (0.027) **	-0.017 (0.025)	0.075 (0.026) *	0.095 (0.022) **	0.117 (0.023) **	0.047 (0.028)
ESCSG10	0.116 (0.021) **	0.089 (0.024) **	0.028 (0.030)	0.120 (0.023) **	0.144 (0.025) **	0.131 (0.024) **	0.065 (0.028)
ESCSG Missing	0.066 (0.057)	0.136 (0.089)	-0.032 (0.079)	-0.177 (0.079)	0.129 (0.099)	-0.139 (0.094)	0.038 (0.067)
EXER 1 (ref: 0)	0.006 (0.015)	0.048 (0.026)	0.096 (0.025) **	0.019 (0.020)	0.011 (0.019)	-0.058 (0.017) **	0.037 (0.020)
EXER 2	0.053 (0.013) **	0.075 (0.018) **	0.129 (0.022) **	0.004 (0.019)	0.045 (0.014) *	-0.089 (0.015) **	0.062 (0.015) **
EXER 3	0.095 (0.016) **	0.109 (0.022) **	0.170 (0.021) **	0.084 (0.021) **	0.090 (0.019) **	-0.107 (0.015) **	0.108 (0.018) **
EXER 4	0.098 (0.014) **	0.124 (0.020) **	0.195 (0.019) **	0.069 (0.018) **	0.126 (0.018) **	-0.114 (0.016) **	0.121 (0.017) **
EXER 5	0.160 (0.016) **	0.183 (0.020) **	0.219 (0.019) **	0.105 (0.019) **	0.179 (0.017) **	-0.154 (0.017) **	0.200 (0.017) **
EXER 6	0.112 (0.019) **	0.192 (0.022) **	0.241 (0.023) **	0.040 (0.025)	0.136 (0.022) **	-0.166 (0.018) **	0.156 (0.020) **
EXER 7	0.100 (0.026) **	0.210 (0.037) **	0.242 (0.042) **	0.021 (0.031)	0.154 (0.040) **	-0.172 (0.035) **	0.161 (0.035) **
EXER 8	0.125 (0.022) **	0.194 (0.025) **	0.213 (0.028) **	0.068 (0.026) *	0.130 (0.026) **	-0.149 (0.024) **	0.181 (0.023) **
EXER 9	0.152 (0.039) **	0.187 (0.046) **	0.215 (0.052) **	0.087 (0.051)	0.194 (0.045) **	-0.109 (0.049)	0.221 (0.043) **
EXER 10	0.191 (0.015) **	0.311 (0.021) **	0.277 (0.020) **	0.155 (0.019) **	0.286 (0.018) **	-0.215 (0.019) **	0.258 (0.021) **
EXER Missing	-0.180 (0.121)	-0.064 (0.169)	0.303 (0.125)	-0.116 (0.112)	0.304 (0.178)	-0.266 (0.137)	0.156 (0.122)
FAMSUPG Low (ref: High)	-0.190 (0.011) **	-0.242 (0.015) **	-0.384 (0.012) **	-0.146 (0.015) **	-0.450 (0.014) **	0.138 (0.013) **	-0.042 (0.014) *
FAMSUPG Medium	-0.126 (0.012) **	-0.118 (0.014) **	-0.154 (0.013) **	-0.098 (0.015) **	-0.251 (0.013) **	0.075 (0.013) **	-0.017 (0.012)
FAMSUPG Missing	-0.137 (0.023) **	-0.099 (0.022) **	-0.185 (0.025) **	-0.055 (0.020) *	-0.228 (0.022) **	0.041 (0.021)	-0.003 (0.023)
Grade G10 (ref: G7)	0.067 (0.070)	0.128 (0.093)	-0.090 (0.085)	-0.135 (0.074)	0.043 (0.108)	0.070 (0.083)	-0.059 (0.083)
Grade G11	0.091 (0.076)	0.110 (0.097)	-0.123 (0.085)	-0.194 (0.075) *	-0.027 (0.109)	0.062 (0.082)	-0.002 (0.083)
Grade G12	-0.022 (0.123)	0.126 (0.131)	-0.234 (0.214)	-0.211 (0.134)	-0.163 (0.157)	0.172 (0.170)	-0.153 (0.167)
Grade G8	-0.006 (0.068)	0.098 (0.096)	-0.134 (0.086)	-0.099 (0.077)	0.036 (0.105)	-0.000 (0.084)	0.024 (0.091)

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
Grade G9	0.072 (0.069)	0.130 (0.094)	-0.109 (0.084)	-0.105 (0.072)	0.058 (0.106)	0.036 (0.082)	-0.012 (0.087)
Grade Ungraded	-0.297 (0.109) *	0.525 (0.443)	-0.101 (0.260)	-0.144 (0.152)	0.290 (0.220)	-0.267 (0.107)	0.208 (0.126)
NEGSCH Severe (ref: Low)	-0.016 (0.016)	0.018 (0.019)	0.013 (0.018)	-0.048 (0.018) *	0.006 (0.018)	-0.028 (0.015)	0.034 (0.016)
NEGSCH Medium	0.001 (0.011)	-0.016 (0.014)	-0.007 (0.017)	-0.013 (0.015)	-0.001 (0.012)	-0.012 (0.014)	0.034 (0.013) *
NEGSCH Missing	0.010 (0.025)	-0.035 (0.038)	0.051 (0.032)	-0.039 (0.035)	-0.065 (0.037)	-0.018 (0.032)	0.007 (0.023)
NFREN Low (ref: High)	-0.288 (0.011) **	-0.166 (0.013) **	-0.284 (0.013) **	-0.096 (0.014) **	-0.257 (0.017) **	0.146 (0.012) **	-0.106 (0.013) **
NFREN Medium	-0.118 (0.010) **	-0.088 (0.013) **	-0.090 (0.015) **	-0.045 (0.013) **	-0.130 (0.014) **	0.064 (0.012) **	-0.068 (0.013) **
NFREN Missing	-0.231 (0.027) **	-0.028 (0.043)	-0.152 (0.042) **	-0.075 (0.039)	-0.238 (0.043) **	-0.086 (0.047)	0.022 (0.035)
Ability	0.001 (0.000) **	0.000 (0.000)	-0.001 (0.000) **	0.001 (0.000) **	0.000 (0.000) *	0.000 (0.000) **	0.001 (0.000) **
RELATSTG Low (ref: High)	-0.429 (0.011) **	-0.278 (0.017) **	-0.363 (0.013) **	-0.484 (0.013) **	-0.598 (0.016) **	0.224 (0.013) **	-0.125 (0.012) **
RELATSTG Medium	-0.316 (0.011) **	-0.170 (0.014) **	-0.135 (0.013) **	-0.428 (0.013) **	-0.399 (0.014) **	0.057 (0.012) **	-0.052 (0.012) **
RELATSTG Missing	-0.340 (0.090) **	-0.264 (0.078) **	-0.215 (0.087)	-0.166 (0.089)	-0.540 (0.085) **	-0.069 (0.083)	0.064 (0.078)
SCHTYPEG Private_govt (ref: Missing)	-0.091 (0.033) *	-0.060 (0.042)	0.054 (0.042)	-0.113 (0.054)	-0.074 (0.049)	0.020 (0.041)	-0.009 (0.035)
SCHTYPEG Private_ind	-0.020 (0.036)	-0.086 (0.046)	0.001 (0.047)	0.009 (0.050)	-0.113 (0.043) *	0.052 (0.042)	-0.037 (0.039)
SCHTYPEG Public	-0.080 (0.028) *	-0.006 (0.039)	0.099 (0.039)	-0.097 (0.043)	-0.031 (0.040)	0.021 (0.035)	-0.008 (0.032)
SKIP no_skip (ref: Missing)	0.206 (0.049) **	0.017 (0.079)	0.076 (0.071)	0.059 (0.076)	0.154 (0.098)	-0.285 (0.061) **	0.070 (0.071)
SKIP skipped	0.155 (0.048) **	0.022 (0.080)	-0.021 (0.070)	0.007 (0.077)	0.027 (0.098)	-0.114 (0.062)	0.062 (0.074)
STRATIOG Low (ref: High)	-0.004 (0.012)	0.018 (0.024)	0.034 (0.019)	0.019 (0.021)	0.016 (0.019)	-0.061 (0.017) **	0.006 (0.016)
STRATIOG Medium	-0.006 (0.013)	-0.000 (0.018)	-0.002 (0.017)	0.038 (0.017)	-0.003 (0.018)	-0.028 (0.014)	-0.018 (0.016)
STRATIOG Missing	-0.045 (0.026)	0.008 (0.035)	0.037 (0.034)	0.006 (0.035)	0.013 (0.035)	-0.037 (0.035)	-0.030 (0.028)
WORKH 1 (ref: 0)	0.016 (0.023)	0.033 (0.027)	0.021 (0.031)	-0.015 (0.026)	-0.034 (0.024)	-0.007 (0.024)	0.002 (0.021)
WORKH 2	0.022 (0.015)	0.035 (0.021)	0.023 (0.026)	-0.002 (0.018)	-0.023 (0.018)	0.050 (0.018) *	-0.032 (0.019)
WORKH 3	0.036 (0.017)	0.032 (0.020)	0.028 (0.022)	-0.015 (0.022)	-0.002 (0.018)	0.061 (0.019) *	-0.048 (0.020)
WORKH 4	-0.015 (0.018)	0.018 (0.023)	0.022 (0.023)	-0.031 (0.018)	-0.029 (0.019)	0.047 (0.018) *	-0.021 (0.017)
WORKH 5	0.002 (0.017)	0.033 (0.019)	0.090 (0.023) **	-0.035 (0.020)	0.053 (0.018) *	0.061 (0.019) *	-0.032 (0.016)
WORKH 6	0.000 (0.018)	-0.003 (0.022)	0.047 (0.025)	-0.054 (0.021) *	-0.038 (0.021)	0.056 (0.022)	-0.026 (0.018)
WORKH 7	0.001 (0.023)	0.000 (0.027)	0.017 (0.036)	-0.046 (0.028)	-0.018 (0.028)	0.090 (0.029) *	-0.021 (0.029)
WORKH 8	0.029 (0.021)	-0.005 (0.027)	0.094 (0.031) *	-0.079 (0.026) *	-0.030 (0.021)	0.073 (0.023) **	-0.047 (0.024)
WORKH 9	-0.016 (0.026)	0.014 (0.031)	0.029 (0.040)	-0.135 (0.041) **	0.068 (0.032)	0.060 (0.035)	0.026 (0.033)
WORKH 10	0.036 (0.016)	0.047 (0.022)	0.097 (0.022) **	-0.024 (0.017)	0.083 (0.018) **	0.067 (0.018) **	0.007 (0.018)

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
WORKH Missing	0.085 (0.117)	0.003 (0.126)	-0.044 (0.097)	0.103 (0.099)	0.037 (0.161)	0.098 (0.103)	0.058 (0.108)
WORKP 1 (ref: 0)	0.001 (0.019)	0.090 (0.029) *	0.036 (0.033)	-0.009 (0.024)	-0.009 (0.027)	0.051 (0.023)	0.033 (0.024)
WORKP 2	-0.006 (0.020)	0.023 (0.024)	-0.016 (0.027)	-0.010 (0.023)	0.002 (0.024)	0.028 (0.021)	0.103 (0.025) **
WORKP 3	-0.008 (0.027)	0.032 (0.043)	-0.005 (0.044)	0.007 (0.035)	-0.005 (0.032)	0.044 (0.037)	0.143 (0.037) **
WORKP 4	-0.056 (0.028)	0.045 (0.040)	0.015 (0.036)	-0.100 (0.033) *	-0.022 (0.031)	0.019 (0.029)	0.116 (0.031) **
WORKP 5	-0.083 (0.029) *	0.007 (0.037)	0.047 (0.038)	0.039 (0.033)	0.031 (0.039)	-0.067 (0.035)	0.037 (0.035)
WORKP 6	-0.002 (0.036)	0.028 (0.041)	0.039 (0.044)	-0.090 (0.042)	-0.072 (0.042)	0.137 (0.044) *	0.163 (0.039) **
WORKP 7	-0.231 (0.082) *	0.092 (0.070)	-0.022 (0.084)	-0.130 (0.073)	-0.046 (0.068)	0.088 (0.078)	0.034 (0.056)
WORKP 8	-0.106 (0.073)	0.023 (0.053)	-0.023 (0.059)	-0.039 (0.057)	-0.064 (0.053)	0.196 (0.058) **	0.007 (0.052)
WORKP 9	-0.313 (0.068) **	-0.296 (0.101) *	-0.065 (0.118)	0.134 (0.092)	0.031 (0.139)	0.144 (0.091)	0.054 (0.095)
WORKP 10	-0.113 (0.032) **	0.024 (0.034)	0.028 (0.037)	-0.076 (0.034)	0.048 (0.035)	0.072 (0.036)	0.111 (0.037) *
WORKP Missing	0.176 (0.106)	0.145 (0.116)	0.239 (0.100)	-0.019 (0.077)	0.092 (0.079)	0.088 (0.102)	0.076 (0.115)
Boys (ref: Girls)	0.107 (0.009) **	0.219 (0.012) **	0.169 (0.012) **	0.229 (0.011) **	0.127 (0.014) **	-0.542 (0.011) **	0.495 (0.011) **
Browsing SM (Weekday)	0.022 (0.005) **	0.008 (0.007)	-0.000 (0.007)	0.011 (0.006)	-0.004 (0.006)	0.060 (0.006) **	-0.029 (0.005) **
Gaming (Weekday)	-0.020 (0.005) **	0.020 (0.005) **	0.004 (0.006)	-0.013 (0.006)	0.010 (0.006)	-0.003 (0.005)	0.012 (0.006)
Browsing SM (Weekend)	0.022 (0.005) **	-0.017 (0.006) *	-0.033 (0.006) **	0.000 (0.006)	0.000 (0.006)	0.056 (0.005) **	-0.035 (0.005) **
Gaming (Weekend)	-0.009 (0.005)	0.001 (0.004)	-0.023 (0.005) **	-0.003 (0.005)	0.009 (0.005)	0.024 (0.005) **	-0.001 (0.005)
R-squared	0.199 (0.004)	0.149 (0.004)	0.180 (0.004)	0.124 (0.004)	0.224 (0.004)	0.214 (0.003)	0.159 (0.004)
Weighted count	38895	32933	29260	34973	34874	38799	32353

Notes: Digital usage variables were coded as numeric values from 1 (0 hours), 2 (< 1 hours), ... , to 6 (> 7 hours). "SM" denotes social media, and "ref" denotes the reference group. Coefficients significantly different from 0 at p value ≤ 0.001 were indicated by **, and * for those significant at $p \leq 0.01$. Standard errors (in parentheses) were estimated using Balanced Repeated Replication weights, which were adjusted to ensure equal country representation. These weights accounted for the clustering of students within schools and other aspects of the survey design.

Table S2: Full output from seven regression models using the specification from Model 2

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
(Intercept)	-0.269 (0.235)	-1.045 (0.324) **	0.626 (0.321)	-0.937 (0.305) *	0.342 (0.305)	-0.423 (0.274)	-0.992 (0.299) **
AGE	-0.025 (0.015)	0.025 (0.019)	0.000 (0.018)	0.031 (0.018)	-0.029 (0.018)	0.016 (0.015)	0.024 (0.017)
BMIG Low (ref: High)		0.354 (0.012) **					
BMIG Medium		0.292 (0.013) **					
BMIG Missing		0.046 (0.021)					
BULLIEDG Low (ref: High)	0.383 (0.009) **	0.234 (0.012) **	0.298 (0.014) **	0.177 (0.012) **	0.332 (0.010) **	-0.490 (0.010) **	0.284 (0.012) **
BULLIEDG Medium	0.217 (0.010) **	0.120 (0.016) **	0.139 (0.015) **	0.134 (0.013) **	0.135 (0.014) **	-0.254 (0.013) **	0.163 (0.014) **
BULLIEDG Missing	0.006 (0.121)	0.300 (0.103) *	0.014 (0.128)	-0.042 (0.134)	-0.028 (0.129)	-0.115 (0.113)	0.126 (0.082)
Country CRI (ref: BRA)	0.017 (0.061)		-0.132 (0.088)	0.241 (0.088) *		0.518 (0.097) **	0.043 (0.069)
Country ESP	0.284 (0.033) **	0.098 (0.044)	-0.442 (0.036) **		0.191 (0.043) **	0.063 (0.035)	-0.006 (0.029)
Country HKG	-0.278 (0.024) **	-0.071 (0.031)	-0.013 (0.037)	0.040 (0.038)	-0.017 (0.032)	-0.112 (0.035) **	-0.069 (0.028)
Country HUN	0.153 (0.025) **	-0.127 (0.031) **	-0.107 (0.031) **	0.115 (0.031) **	0.057 (0.026)	0.280 (0.029) **	0.103 (0.026) **
Country IRL	-0.141 (0.032) **	-0.029 (0.049)	-0.065 (0.048)	0.174 (0.053) **	0.102 (0.044)	0.045 (0.042)	-0.024 (0.041)
Country MAC	-0.198 (0.096)	0.020 (0.094)	-0.191 (0.098)	-0.229 (0.095)	0.089 (0.099)	0.108 (0.097)	-0.239 (0.087) *
Country PAN	-0.053 (0.028)	0.290 (0.030) **	-0.210 (0.034) **	0.339 (0.034) **	0.176 (0.031) **	0.072 (0.033)	
Country SAU	0.120 (0.022) **	0.568 (0.037) **	0.056 (0.026)	0.317 (0.029) **	0.791 (0.028) **	-0.056 (0.026)	
Country SVN	0.088 (0.024) **	-0.055 (0.032)	-0.302 (0.029) **	0.255 (0.034) **	0.127 (0.025) **	-0.082 (0.025) **	-0.067 (0.021) *
CSRATIOG Low (ref: High)	-0.005 (0.016)	-0.024 (0.019)	-0.019 (0.020)	-0.027 (0.019)	-0.005 (0.019)	0.022 (0.017)	-0.032 (0.016)
CSRATIOG Medium	0.009 (0.012)	0.016 (0.015)	-0.006 (0.017)	0.000 (0.017)	0.001 (0.015)	0.005 (0.015)	-0.002 (0.013)
CSRATIOG Missing	0.022 (0.029)	0.027 (0.034)	-0.049 (0.034)	0.002 (0.035)	0.022 (0.037)	0.014 (0.030)	0.040 (0.029)
DFREN 1 (ref: 0)	0.162 (0.011) **	0.069 (0.020) **	0.133 (0.024) **	0.087 (0.019) **	0.095 (0.016) **	-0.090 (0.018) **	0.047 (0.018) *
DFREN 2	0.225 (0.013) **	0.109 (0.020) **	0.222 (0.019) **	0.084 (0.018) **	0.133 (0.017) **	-0.116 (0.016) **	0.093 (0.017) **
DFREN 3	0.268 (0.014) **	0.141 (0.019) **	0.241 (0.024) **	0.089 (0.021) **	0.152 (0.017) **	-0.129 (0.015) **	0.138 (0.019) **
DFREN 4	0.258 (0.016) **	0.170 (0.020) **	0.285 (0.024) **	0.094 (0.020) **	0.148 (0.021) **	-0.143 (0.018) **	0.144 (0.018) **
DFREN 5	0.299 (0.015) **	0.189 (0.018) **	0.322 (0.021) **	0.103 (0.020) **	0.206 (0.016) **	-0.171 (0.020) **	0.146 (0.018) **
DFREN 6	0.307 (0.017) **	0.209 (0.023) **	0.330 (0.025) **	0.173 (0.018) **	0.222 (0.022) **	-0.134 (0.021) **	0.134 (0.024) **
DFREN Missing	0.184 (0.033) **	0.142 (0.058)	0.179 (0.067) *	0.053 (0.049)	0.081 (0.069)	-0.081 (0.060)	0.047 (0.039)
ESCSG 2 (ref: 1)	0.019 (0.021)	0.037 (0.023)	-0.021 (0.027)	-0.034 (0.026)	0.033 (0.024)	0.032 (0.023)	0.018 (0.021)

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
ESCSG 3	0.017 (0.019)	0.027 (0.023)	-0.024 (0.023)	-0.023 (0.026)	0.015 (0.024)	0.062 (0.024)	-0.009 (0.020)
ESCSG 4	0.029 (0.020)	0.033 (0.022)	-0.026 (0.022)	-0.025 (0.025)	0.025 (0.022)	0.073 (0.021) **	0.028 (0.022)
ESCSG 5	0.054 (0.022)	0.059 (0.022) *	-0.027 (0.027)	-0.008 (0.028)	0.053 (0.024)	0.052 (0.023)	0.022 (0.024)
ESCSG 6	0.052 (0.018) *	0.032 (0.026)	-0.028 (0.024)	-0.004 (0.027)	0.041 (0.023)	0.110 (0.022) **	0.000 (0.025)
ESCSG 7	0.052 (0.020)	0.073 (0.023) *	-0.036 (0.028)	-0.003 (0.025)	0.058 (0.027)	0.080 (0.024) **	0.005 (0.024)
ESCSG 8	0.089 (0.021) **	0.064 (0.025) *	-0.043 (0.029)	0.065 (0.027)	0.085 (0.026) **	0.120 (0.023) **	-0.001 (0.025)
ESCSG 9	0.104 (0.022) **	0.086 (0.027) **	-0.019 (0.025)	0.075 (0.026) *	0.095 (0.022) **	0.117 (0.023) **	0.045 (0.028)
ESCSG 10	0.116 (0.021) **	0.088 (0.024) **	0.026 (0.030)	0.119 (0.023) **	0.145 (0.025) **	0.132 (0.024) **	0.062 (0.028)
ESCSG Missing	0.066 (0.057)	0.136 (0.088)	-0.028 (0.078)	-0.175 (0.079)	0.129 (0.099)	-0.141 (0.094)	0.039 (0.067)
EXER 1 (ref: 0)	0.006 (0.015)	0.047 (0.026)	0.096 (0.025) **	0.019 (0.020)	0.011 (0.019)	-0.058 (0.017) **	0.036 (0.020)
EXER 2	0.052 (0.013) **	0.074 (0.018) **	0.128 (0.022) **	0.004 (0.019)	0.044 (0.014) *	-0.088 (0.015) **	0.061 (0.015) **
EXER 3	0.093 (0.016) **	0.105 (0.022) **	0.167 (0.021) **	0.083 (0.021) **	0.087 (0.019) **	-0.106 (0.015) **	0.105 (0.018) **
EXER 4	0.097 (0.014) **	0.119 (0.020) **	0.192 (0.019) **	0.068 (0.019) **	0.122 (0.018) **	-0.113 (0.016) **	0.117 (0.018) **
EXER 5	0.159 (0.017) **	0.179 (0.020) **	0.216 (0.019) **	0.104 (0.019) **	0.177 (0.017) **	-0.153 (0.017) **	0.196 (0.017) **
EXER 6	0.111 (0.019) **	0.187 (0.022) **	0.237 (0.024) **	0.039 (0.025)	0.133 (0.022) **	-0.165 (0.018) **	0.152 (0.021) **
EXER 7	0.099 (0.026) **	0.206 (0.037) **	0.239 (0.042) **	0.019 (0.031)	0.153 (0.040) **	-0.170 (0.035) **	0.156 (0.035) **
EXER 8	0.124 (0.022) **	0.188 (0.025) **	0.209 (0.028) **	0.067 (0.026)	0.127 (0.026) **	-0.148 (0.024) **	0.176 (0.023) **
EXER 9	0.150 (0.039) **	0.180 (0.047) **	0.207 (0.053) **	0.085 (0.051)	0.192 (0.045) **	-0.106 (0.049)	0.214 (0.043) **
EXER 10	0.189 (0.015) **	0.304 (0.021) **	0.270 (0.020) **	0.153 (0.019) **	0.284 (0.018) **	-0.213 (0.019) **	0.251 (0.021) **
EXER Missing	-0.180 (0.121)	-0.068 (0.170)	0.306 (0.124)	-0.118 (0.113)	0.299 (0.178)	-0.267 (0.138)	0.155 (0.124)
FAMSUPG Low (ref: High)	-0.190 (0.011) **	-0.241 (0.014) **	-0.384 (0.011) **	-0.146 (0.015) **	-0.448 (0.014) **	0.138 (0.013) **	-0.042 (0.014) *
FAMSUPG Medium	-0.126 (0.012) **	-0.118 (0.014) **	-0.154 (0.013) **	-0.098 (0.015) **	-0.251 (0.013) **	0.075 (0.013) **	-0.017 (0.012)
FAMSUPG Missing	-0.137 (0.023) **	-0.099 (0.022) **	-0.184 (0.025) **	-0.055 (0.020) *	-0.228 (0.022) **	0.041 (0.021)	-0.003 (0.023)
Grade G10 (ref: G7)	0.067 (0.070)	0.131 (0.093)	-0.091 (0.084)	-0.134 (0.074)	0.044 (0.107)	0.070 (0.083)	-0.056 (0.083)
Grade G11	0.091 (0.076)	0.113 (0.096)	-0.123 (0.084)	-0.194 (0.075) *	-0.025 (0.107)	0.062 (0.082)	0.000 (0.083)
Grade G12	-0.022 (0.123)	0.136 (0.132)	-0.234 (0.212)	-0.210 (0.134)	-0.157 (0.156)	0.171 (0.170)	-0.146 (0.166)
Grade G8	-0.006 (0.068)	0.100 (0.095)	-0.136 (0.085)	-0.099 (0.076)	0.034 (0.104)	-0.001 (0.084)	0.024 (0.090)
Grade G9	0.073 (0.069)	0.133 (0.094)	-0.110 (0.084)	-0.105 (0.072)	0.060 (0.105)	0.036 (0.082)	-0.010 (0.087)
Grade Ungraded	-0.294 (0.111) *	0.514 (0.439)	-0.123 (0.246)	-0.148 (0.151)	0.310 (0.222)	-0.255 (0.110)	0.198 (0.123)

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
NEGSCH Severe (ref: Low)	-0.016 (0.016)	0.018 (0.019)	0.012 (0.018)	-0.048 (0.018) *	0.006 (0.018)	-0.027 (0.015)	0.034 (0.016)
NEGSCH Medium	0.001 (0.011)	-0.016 (0.014)	-0.007 (0.017)	-0.013 (0.015)	-0.001 (0.012)	-0.012 (0.014)	0.034 (0.013) *
NEGSCH Missing	0.010 (0.025)	-0.036 (0.038)	0.050 (0.032)	-0.039 (0.035)	-0.065 (0.036)	-0.018 (0.032)	0.007 (0.023)
NFREN Low (ref: High)	-0.287 (0.011) **	-0.166 (0.013) **	-0.284 (0.013) **	-0.096 (0.014) **	-0.257 (0.017) **	0.146 (0.012) **	-0.107 (0.013) **
NFREN Medium	-0.117 (0.010) **	-0.087 (0.013) **	-0.090 (0.015) **	-0.044 (0.013) **	-0.129 (0.014) **	0.064 (0.012) **	-0.068 (0.013) **
NFREN Missing	-0.230 (0.026) **	-0.027 (0.044)	-0.154 (0.042) **	-0.075 (0.039)	-0.236 (0.043) **	-0.086 (0.047)	0.022 (0.035)
Ability	0.001 (0.000) **	0.000 (0.000)	-0.001 (0.000) **	0.001 (0.000) **	0.000 (0.000)	0.000 (0.000) **	0.001 (0.000) **
RELATSTG Low (ref: High)	-0.428 (0.011) **	-0.276 (0.017) **	-0.362 (0.013) **	-0.484 (0.013) **	-0.595 (0.016) **	0.225 (0.013) **	-0.124 (0.013) **
RELATSTG Medium	-0.316 (0.011) **	-0.169 (0.014) **	-0.134 (0.013) **	-0.428 (0.013) **	-0.397 (0.014) **	0.057 (0.012) **	-0.052 (0.012) **
RELATSTG Missing	-0.340 (0.090) **	-0.267 (0.078) **	-0.220 (0.086)	-0.167 (0.089)	-0.539 (0.085) **	-0.067 (0.083)	0.062 (0.078)
SCHTYPEG Private_govt (ref: Missing)	-0.091 (0.033) *	-0.061 (0.042)	0.054 (0.041)	-0.113 (0.054)	-0.076 (0.049)	0.020 (0.041)	-0.010 (0.035)
SCHTYPEG Private_ind	-0.020 (0.036)	-0.086 (0.046)	-0.001 (0.047)	0.009 (0.050)	-0.115 (0.043) *	0.052 (0.042)	-0.039 (0.039)
SCHTYPEG Public	-0.081 (0.028) *	-0.007 (0.039)	0.099 (0.039)	-0.097 (0.043)	-0.033 (0.040)	0.021 (0.035)	-0.009 (0.032)
SKIP no_skip (ref: Missing)	0.206 (0.049) **	0.019 (0.078)	0.074 (0.070)	0.059 (0.076)	0.150 (0.097)	-0.285 (0.061) **	0.072 (0.071)
SKIP skipped	0.155 (0.048) **	0.025 (0.079)	-0.022 (0.070)	0.007 (0.077)	0.025 (0.097)	-0.114 (0.063)	0.065 (0.074)
STRATIOG Low (ref: High)	-0.004 (0.012)	0.019 (0.024)	0.035 (0.019)	0.018 (0.021)	0.016 (0.019)	-0.060 (0.017) **	0.007 (0.016)
STRATIOG Medium	-0.006 (0.013)	0.001 (0.018)	-0.002 (0.017)	0.038 (0.017)	-0.002 (0.018)	-0.028 (0.014)	-0.018 (0.016)
STRATIOG Missing	-0.044 (0.026)	0.009 (0.035)	0.038 (0.034)	0.006 (0.035)	0.013 (0.035)	-0.037 (0.035)	-0.028 (0.028)
WORKH 1 (ref: 0)	0.016 (0.023)	0.031 (0.027)	0.021 (0.031)	-0.016 (0.026)	-0.033 (0.024)	-0.006 (0.024)	0.000 (0.021)
WORKH 2	0.022 (0.015)	0.033 (0.021)	0.023 (0.026)	-0.002 (0.018)	-0.023 (0.018)	0.051 (0.018) *	-0.034 (0.018)
WORKH 3	0.036 (0.017)	0.033 (0.020)	0.029 (0.022)	-0.014 (0.022)	-0.001 (0.018)	0.060 (0.019) *	-0.049 (0.020)
WORKH 4	-0.015 (0.018)	0.016 (0.023)	0.021 (0.023)	-0.031 (0.018)	-0.029 (0.019)	0.047 (0.018) *	-0.023 (0.017)
WORKH 5	0.002 (0.017)	0.032 (0.019)	0.091 (0.023) **	-0.035 (0.020)	0.054 (0.018) *	0.062 (0.019) **	-0.033 (0.016)
WORKH 6	0.000 (0.018)	-0.004 (0.022)	0.047 (0.025)	-0.055 (0.021) *	-0.038 (0.021)	0.057 (0.022)	-0.027 (0.018)
WORKH 7	0.001 (0.023)	-0.001 (0.027)	0.018 (0.036)	-0.046 (0.028)	-0.018 (0.028)	0.090 (0.029) *	-0.022 (0.029)
WORKH 8	0.029 (0.021)	-0.007 (0.027)	0.094 (0.031) *	-0.079 (0.026) *	-0.031 (0.021)	0.073 (0.023) **	-0.048 (0.024)
WORKH 9	-0.016 (0.026)	0.014 (0.031)	0.029 (0.040)	-0.135 (0.041) **	0.069 (0.032)	0.060 (0.035)	0.025 (0.033)
WORKH 10	0.036 (0.016)	0.045 (0.022)	0.096 (0.022) **	-0.024 (0.016)	0.082 (0.018) **	0.067 (0.018) **	0.007 (0.018)
WORKH Missing	0.086 (0.116)	0.001 (0.125)	-0.038 (0.097)	0.103 (0.099)	0.044 (0.162)	0.099 (0.103)	0.055 (0.108)

Variable	Dependent variable						
	BELONG	BODYIMA	EXPWB	FEELSAFE	LIFESAT	PSYCHSYM	STRESAGR
WORKP 1 (ref: 0)	-0.000 (0.019)	0.087 (0.029) *	0.033 (0.032)	-0.010 (0.024)	-0.011 (0.027)	0.052 (0.023)	0.031 (0.024)
WORKP 2	-0.007 (0.020)	0.023 (0.025)	-0.016 (0.027)	-0.010 (0.023)	0.005 (0.024)	0.029 (0.021)	0.102 (0.025) **
WORKP 3	-0.009 (0.027)	0.031 (0.043)	-0.008 (0.044)	0.007 (0.035)	-0.006 (0.032)	0.044 (0.037)	0.142 (0.037) **
WORKP 4	-0.055 (0.028)	0.045 (0.039)	0.013 (0.036)	-0.100 (0.033) *	-0.019 (0.031)	0.020 (0.029)	0.114 (0.031) **
WORKP 5	-0.084 (0.029) *	0.006 (0.037)	0.045 (0.038)	0.038 (0.033)	0.033 (0.039)	-0.066 (0.035)	0.034 (0.035)
WORKP 6	-0.003 (0.036)	0.025 (0.042)	0.035 (0.044)	-0.091 (0.042)	-0.071 (0.042)	0.139 (0.044) *	0.161 (0.039) **
WORKP 7	-0.232 (0.082) *	0.088 (0.070)	-0.029 (0.084)	-0.132 (0.072)	-0.048 (0.069)	0.090 (0.078)	0.031 (0.056)
WORKP 8	-0.105 (0.072)	0.022 (0.053)	-0.023 (0.060)	-0.039 (0.057)	-0.061 (0.053)	0.197 (0.058) **	0.006 (0.052)
WORKP 9	-0.314 (0.068) **	-0.293 (0.100) *	-0.069 (0.118)	0.134 (0.092)	0.028 (0.140)	0.144 (0.091)	0.052 (0.096)
WORKP 10	-0.113 (0.032) **	0.023 (0.034)	0.027 (0.037)	-0.076 (0.034)	0.048 (0.035)	0.073 (0.036)	0.108 (0.037) *
WORKP Missing	0.173 (0.105)	0.140 (0.114)	0.227 (0.099)	-0.022 (0.077)	0.087 (0.077)	0.091 (0.102)	0.067 (0.114)
Boys (ref: Girls)	0.035 (0.025)	0.026 (0.033)	0.022 (0.030)	0.197 (0.029) **	-0.088 (0.034) *	-0.541 (0.029) **	0.377 (0.032) **
Browsing SM (Weekday)	0.013 (0.007)	0.005 (0.009)	-0.007 (0.009)	0.010 (0.008)	0.000 (0.008)	0.061 (0.008) **	-0.040 (0.008) **
Gaming (Weekday)	-0.024 (0.007) **	0.022 (0.008) *	-0.011 (0.008)	-0.015 (0.008)	-0.009 (0.008)	-0.005 (0.007)	0.020 (0.008) *
Browsing SM (Weekend)	0.022 (0.007) **	-0.042 (0.009) **	-0.050 (0.009) **	-0.005 (0.007)	-0.018 (0.007)	0.063 (0.007) **	-0.048 (0.006) **
Gaming (Weekend)	-0.008 (0.006)	-0.001 (0.008)	-0.009 (0.008)	0.001 (0.007)	0.005 (0.006)	0.018 (0.006) *	-0.002 (0.007)
Browsing SM (Weekday) * Boys	0.020 (0.011)	0.008 (0.012)	0.014 (0.013)	0.003 (0.012)	-0.009 (0.013)	-0.003 (0.012)	0.023 (0.012)
Browsing SM (Weekend) * Boys	-0.001 (0.010)	0.055 (0.012) **	0.037 (0.014) *	0.012 (0.012)	0.034 (0.011) *	-0.016 (0.009)	0.028 (0.011)
Gaming (Weekday) * Boys	0.006 (0.009)	-0.007 (0.012)	0.024 (0.012)	0.003 (0.011)	0.033 (0.011) *	0.006 (0.010)	-0.019 (0.011)
Gaming (Weekend) * Boys	-0.000 (0.009)	0.002 (0.012)	-0.028 (0.012)	-0.009 (0.010)	0.011 (0.010)	0.014 (0.009)	0.000 (0.011)
R-squared	0.199 (0.004)	0.151 (0.004)	0.181 (0.004)	0.124 (0.004)	0.226 (0.004)	0.214 (0.003)	0.160 (0.003)
Weighted count	38895	32933	29260	34973	34874	38799	32353

Notes: Digital usage variables were coded as numeric values from 1 (0 hours), 2 (< 1 hours), ... , to 6 (> 7 hours). "SM" denotes social media, and "ref" denotes the reference group. Coefficients significantly different from 0 at p value ≤ 0.001 were indicated by **, and * for those significant at $p \leq 0.01$. Standard errors (in parentheses) were estimated using Balanced Repeated Replication weights, which were adjusted to ensure equal country representation. These weights accounted for the clustering of students within schools and other aspects of the survey design.