

Supplemental information

Sex-specific relationships between adolescent digital media activities and mental health outcomes

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Methods

Survey administration details

The initial survey at T1 was issued as part of the age 10-12 group sampling as issued by the Youth in Iceland surveys. These surveys exclude more sensitive questions (*e.g.* on self-harm and suicide), relative to the age 13-15 surveys issued at T2 and T3. To ensure consistency and comparability over the course of the study and to prioritise inclusion of all time points, such questions were excluded across all surveys, leading in some cases to adapted versions of standardised scales (Table S1). Measurement invariance testing, detailed later, was used to validate consistency of all scale-based questions and used to generate latent factors over the duration of the study, particularly to evaluate whether alterations in the survey question set lead to different interpretation or answering style of the items.

Social media usage factorability tests

Prior to Exploratory Factor Analysis (EFA) to determine grouping of survey items, preliminary tests were conducted to determine factorability with various functions of the EFA.dimensions R package (FACTORABILITY), with a Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) threshold of >0.7, and individual variable scores exceeding 0.6. Number of components was evaluated using parallel analysis of eigenvalues (RAWPAW, specifying PCA and PAF factoring) and the empirical Kaiser criterion method (EMPKC). EFA analysis was run with the varimax rotation and spearman correlation specifications with results replicated at T2 and T3.

Confounder items

Parental social support

The parental social support scale comprises of five survey questions, asked consistently across waves (Table S1). To evaluate the appropriateness of inclusion as a stable (*i.e.* time invariant) measure in models a series of analyses were completed. To create a stable estimate of parental social support, rather than taking a mean score across time without evidence to support those, additional tests were run. Internal consistency of this measure was high, as indicated by the Cronbach's α ranges of 0.807-0.906 across the survey waves and by sex (Table S2) and measurement invariance tests (Table S3). Linear mixed-effects model (lme4::lmer (Bates *et al.*, 2015) tested the changes over the study period separately for males and females, with participant ID specified as a random effect. The results of the linear model indicated significant declines in reports of parental social support over time with scores overall higher for females, but additionally showing larger declines over time compared to males (see Table S4). Based on these results, to incorporate parental social support as a control variable in the RI-CLPM, rather than using a mean score across waves, an individual-level and time-invariant measure was defined using the extracted random effect scores (participant ID) of the mixed-model. These scores were regressed on the within-person derived latent factors, alongside household structure and language spoken at home in the CLPM and RI-CLPM analyses following existing protocol (Orben *et al.*, 2022).

Household structure (household income proxy)

Participants answered questions on their household care-giver structure with an eight-point scale at T1 and an additional option for living on their own at T2 and T3 (Table S1). A time-invariant binary variable (two-parent (irrespective of biological parentage) or 'other'), assigning the most common response across sampling periods, and assigning 'other' in cases where responses changed during the study period (n=53). Household status is used as a proxy for household income.

Language spoken at home (immigration background proxy)

All participants were born in Iceland but language spoken at home (binary value 0=Icelandic only, 1=non-Icelandic language present) was leveraged as a proxy for cultural background/immigration status of the family to be comparable with previous work (see Supplemental methods, (Haskell *et al.*, 2025)). Maternal and paternal citizenship was reported in the birth and maternal registry datasets, but with high missingness (N=318 missing both parental citizenship data). Analyses suggested good overlap between present parental citizenship data and the language spoken at home stable measure (Figure S1). Where there was a change in response between waves this was assigned to non-Icelandic language present.

Measurement invariance tests

Consistency was evaluated sequentially: 1) evaluating the scale structure over time (configural model, *i.e.*, are the questions and responses measuring the same construct across waves); 2) whether questions showed a consistent relationship to the overall construct across waves (metric model, *i.e.*, do the questions load/contribute equally to the construct); 3) evaluating whether the question's intercept (or threshold) was consistent across waves (scalar model, *i.e.*, do the participants with the same latent construct score choose responses consistently or do they vary between people, regardless of the sampling wave); 4) finally the most restrictive model constrains the residual measurement error to be equal across waves (residual model, *i.e.*, is the measurement error rate for each question consistent)(Mackinnon, Curtis and O'Connor, 2022). The models were run independently for the latent factors capturing depressive symptoms, hostility, conduct disorder and parental social support using the Lavaan package (Rosseel, 2012) confirmatory factor analysis (CFA), specifying the Mean and Variance Adjusted Weighted Least Squares (WLSMV) estimator for ordinal variables, specifying ordered variables, theta parameterisation for residual variance calculation, and accommodating missing values with the pairwise specification, following the tutorial in (Troncoso and Treanor, 2023).

Models were also run for latent factors for active and passive SMU (grouping based on outcome of EFA) which were evaluated using the maximum likelihood (MLR) estimator for continuous variables, with the full information maximum likelihood (FIML) specification accounting for missing data. All models included an error structure that allowed covariances of residuals to be constrained to equality across measurement occasions (Troncoso and Treanor, 2023). Goodness of fit for models were assessed using the following estimators and thresholds: Comparative Fit Index (CFI, >0.90), Tucker Lewis Index (TLI, >0.90), Root Mean Square Error Approximation (RMSEA, <0.05) and Standardised root mean residual (SRMR, <0.08).

Depressive symptoms

Measurement invariance tests for depressive symptom latent factors demonstrated excellent model fit in both males and females, surpassing the fit criteria, even at the robust level (Table S3). Models restricting residual variances failed to converge, and constraining intercept loading did not affect the model fit. Metric models, with individual item factor loading constrained over time (e.g., question 1 has equal variance across waves), were selected to generate the factor scores for the RI-CLPM analysis.

Hostility

Latent factors for the measure of hostility also demonstrated good fit, despite a change in one of the questions from 2017 (Table S1; Table S3). Addition of fixed intercepts in the scalar model led to a decrease in model fit and as in other measures, models restricting residual variances generated negative latent variable outputs. Metric models were selected to generate factor scores.

Conduct problems

Measurement invariance testing on the latent factors for conduct disorder, however, demonstrated significant differences between males and females, with model fit being superior for females. The configural model, which allows all items to vary freely across waves, and tests whether the same factor structure exists over time showed significantly better fit than the metric model that fixes item loadings onto the latent factor over waves. Examination of the loading of items onto the latent factor demonstrated that items two and three (“I broke rules at school” and “I got into fights”) demonstrated altered loading onto latent factors over time, despite there being no changes in this scale across the survey administrations.

A partial invariance metric model was subsequently tested where item loadings were fixed over time for all items except two and three. An ANOVA test suggested that this improved model fit for males significantly ($\chi^2(6) = 31.97$, $p < 0.001$), but no difference was observed in females ($\chi^2(6) = 4.86$, $p = 0.561$). Model fit for the partial invariance model in males improved compared to the metric model and reached standard thresholds for all measures except SRMR (0.108). This indicates different interpretation of the questions over time both between females and males and in males, potentially a different pattern in the way they perceive, report or engage in the items for “I broke rules at school” and “I got into fights” over time. The partial invariance model for males was implemented in the CLPM and RI-CLPM models, and the full metric invariance model was applied for females.

Active and passive SMU

All preliminary factorability tests converged on a two-factor split. Five variables loaded strongly onto one of two factors, with the sixth showing equal variance across both (Table S5).

Active and passive SMU measurement invariance was run as a single model as the responses came from the same scale, however it was run separately for males and females. Initial models included latent factor specification based on the EFA loading and previous work. “Chat or send messages/pictures/videos”, “Chat or send messages/pictures/videos that disappear after reading” and “Post a picture/video of your life” were loaded on the active use latent factor, with the remaining questions defining the passive use latent factor (Table S1, S5). Initial models showed poor model

identification and estimation issues. Evaluation of the factor loadings demonstrated weak factor loadings for the passive use item “Share things other than pictures (*e.g.* news, games, websites)”, which also demonstrated weak loading in the EFA analysis, indicating poor relation to the target construct of passive SMU. Removal of the item improved model fit, convergence, and parsimony (Table S3). Passive use latent factors were subsequently defined by two items “Look at your friends’ pages/accounts” and “Look at pages/accounts of people you don’t know” only and metric invariance structure was applied in downstream modelling approaches.

Factor scores were extracted using Lavaan::lavPredict (Rosseel, 2012) function with default specifications, these formed the input variables for the RI-CLPM and CLPM.

Intraclass correlation (ICC)

ICC analysis was conducted to test the suitability of the data for analysis by RI-CLPM by determining if there are stable between-person effects between the measure as captured by the latent factors for outcomes, and for screen use raw hours (Table S6). This demonstrates, for example in SMU over time, that 29% of variance over the course of the study period is due to stable between-person effects in males (*i.e.*, if a male’s SMU is more or less than other males, he tends to maintain that relative position over time), this increases to 38.5% in females. The remaining, larger proportion of variance (71% in males and 61.5% in females) accounts for within-person changes in SMU over time and other transient influences, as well as measurement error. Females showed higher stability, indicated by the ICC values, than males across all media use measurements.

Results

Random-slope - Random-Intercept models

Due to the significant changes in development during this age range, alongside concurrent changes in screen use, we ran a complementary analysis to evaluate these trends across the study period. The addition of a random slope (RS) that constrains annual measures of both the mental health outcome and screen use to increase linearly over time and standardises normal and predicted increases in these measures across the study, freeing remaining variance to evaluate the deviations in expected behaviour between outcomes. The convergence issues in certain models, and the overfitting suggests that meaningful individual differences in developmental trajectories are negligible for these constructs, or that three waves of data is insufficient to capture changes in such a narrow developmental window (Table S7). However, in most convergent models, fit indices were good (CFI ≥ 0.997 , TLI ~ 1 , RMSEA ≤ 0.017 , SRMR ≤ 0.008). The RS-RS correlations, which evaluate whether the trajectories of screen use and mental health outcomes occur in parallel were uniformly not significant across models in both males and females, providing little evidence that developmental trends in screen use and mental health co-occur at the between-person level in this dataset (Table S8). The cross-construct associations (baseline outcome predicting trajectory of screen use or *vice versa*) were not significant in any models which suggests that initial reports of a mental health outcome do not predict the trajectory of screen use across the study, and *vice versa*. Overall, this analysis does not indicate that the age or developmentally related trajectories in mental health outcomes or screen use are related or influencing the outcomes of the models reported in the primary analysis.

Random Intercept Cross Lagged Panel Model selection

In the first phase of model selection, in all cases the fully-free model with grouping by sex was either significantly better or not significantly different from the constrained models across all outcome and screen types. Model estimates indicated significant age and sex-specific relationships, including in direction of effects, *i.e.*, screen time predicting depressive symptoms appeared to strengthen over time in females, but not males. Based on this and the variation in screen use patterns between males and females over the duration of the study (Figure 1), models for phase two of the model selection process were run separately for males and females (whereas previously sex was a grouping variable). The four

directionality models were compared with a fully free and a fully constrained model compared simultaneously using an Akaike weights procedure (Orben *et al.*, 2022). No model weight exceeded 62%. In no case were the fully free models preferred over others, although they demonstrated close to equivalent fit in some cases, and there were often differences in the preferred model between males and females (Figure S2). Constraining AR effects to be equal over time for depressive symptoms was always highly detrimental for model fit, as was constraining the AR pathway for SMU in females, and VG in males.

RI-CLPM confounder variable analysis

Time-invariant parental social support, household status (single vs dual parent) and language spoken at home (Icelandic only vs other language present) were regressed on the within-person derived outcomes and screen use variables at each time point. The results are consistent and replicated across all models (*i.e.*, the relationship between household status and depressive symptoms is consistent across all three screen type models), but the exact estimates and CI intervals are taken from specific models and noted below, the results for each model can be seen in Supplemental Tables S11 to S13.

As hypothesised, high parental social support was associated with better outcomes in both males and females across all models. Higher levels of parental social support were also strongly related to reduced VG across all models for both sexes. However, parental social support was not associated with SMU in males in any model, but it was associated with decreased SMU in females, yet never at T2. For VW, results were broadly significant or approaching significance in all models.

Coming from a dual-income/two parent household was only a significant predictor for outcomes in males, particularly in its association with reduced depressive symptoms at T2 ($\beta=-0.081$, 95% CI -0.133 to -0.029, $p=0.002$) and T3 ($\beta=-0.117$, 95% CI -0.169-0.065, $p<0.001$), and also hostility at T3 ($\beta=-0.089$, 95% CI -0.143 to -0.036, $p=0.001$) in males, though other timepoints showed borderline significance (reported values taken from the SMU models). No associations between household status and conduct problems reached the adjusted significance threshold. It should also be noted that unlike the depressive symptom and hostility models which showed no relation with household status for females, there was some indication of a weak relationship in females' conduct problems.

As a predictor of screen usage, dual-parent household status only had a significant negative effect on the SMU at T1 in females across all outcome models ($\beta=-0.129$, 95% CI -0.190 to -0.067, $p<0.001$), results presented from depressive symptom-SMU model) and VG in males at T1 ($\beta=-0.086$, 95% CI -0.141 to -0.031, $p=0.002$, results presented from depressive symptom-VG model).

Speaking a language other than Icelandic in the home, a proxy for non-Icelandic heritage, was a significant, positive predictor of depressive symptoms in males at T1 only ($\beta=0.085$, 95% CI 0.038 to 0.132, $p<0.001$), with associations at subsequent time points decreasing. While not meeting the threshold for significance, in the females models the association between depressive symptoms and language strengthened incrementally over time (T1: $\beta=0.031$, 95% CI -0.015 to 0.078, $p=0.183$ to T3: $\beta=0.063$ 95% CI 0.017 to 0.108, $p=0.007$). This trend was mirrored in the hostility and conduct problem models. In the latter, in the models for females the association just surpassed the significance threshold at T3 after a steady rise across the time periods ($\beta=0.085$, 95% CI 0.030 – 0.139, $p=0.002$). For screen uses, speaking a language other than Icelandic in the home was positively associated with higher levels of VG across all time points in males only. In both males and females there were also positive associations with VW at T2 and T3, and in females only on SMU at T3.

Active and passive SMU contemporaneous correlations

Active SMU and depressive symptoms correlations in males were not significant at T2 ($r=0.049$, 95% CI -0.019-0.117, $p=0.155$), but was at T3 ($r=0.278$, 95% CI 0.112-0.444, $p=0.001$), meanwhile in females with the correlation between depressive symptoms at T2 was stronger ($r=0.129$, 95% CI 0.060-0.198, $p<0.001$), than at T3 ($r=0.151$, 95% CI -0.015-0.316, $p=0.075$). This was mirrored in the

passive SMU correlations in females (T2: $r=0.145$, 95% CI 0.078-0.213, $p<0.001$; T3: $r=0.133$, 95% CI 0.044-0.263, $p=0.043$). Within-year correlations in the conduct problem models were highly significant across both sexes and active and passive use at T2, but broadly not reaching significance at T3, except for correlation with conduct problems and active use in males (T3: $r=0.306$, 95% CI 0.127-0.485, $p<0.001$).

Supplementary Tables

Table S1: All survey questions and response options utilised within this study. Changes across years are documented and descriptions of data manipulation are also highlighted.

Survey questions		Response options	Data manipulation
Static variables			
Sex assigned at birth	Coded within the Birth Registry dataset - not a survey question	1. Male 2. Female	There were two cases in which sex data was not contained within the birth registry. These two cases were cross-checked with the survey responses to “What is your gender?” and in both cases the responses were consistent across years and so assigned accordingly (one male and one female).
Language spoken at home	Is Icelandic spoken at your home?	3. Yes, only Icelandic 4. Yes, Icelandic and another language 5. No, only another language	Rescaled to binary (0,1). Item 1 was relabelled as 0 and items 2 or 3 relabelled to 1. A time-invariant, binary, estimate was used in the RI-CLPM calculated by taking the value at T1, and if that was NA then filling with responses at T2 or T3.
Household composition	Who lives at your house?	1. I live with both parents 2. I alternate between living with my father and mother 3. I live mostly with my mother but not with my father 4. I live mostly with my father but not with my mother 5. I live with my mother and her partner 6. I live with my mother and her partner 7. I live with my father and his partner/husband, 8. I live on my own age (T2 and T3 only) 9. I live with another arrangement	Rescaled to binary (0,1). Items 1, 5 and 6 were equated to two-parent household (value 1) or other (value 0). A time-invariant, binary, estimate was used in the RI-CLPM by checking for changes in responses across the period. Those which changed categories were assigned to ‘other’ to encompass the instability.
Parental social support	How easy or difficult is it for you to: a) Get affection and warmth from your parents? b) Discuss personal matters with your parents? c) Get advice about your schoolwork from your parents? d) Get advice about other things from your parents? e) Get help with various tasks from your parents?	1. Very difficult 2. Pretty difficult 3. Pretty easy 4. Very easy	A time-invariant estimate was used in the RI-CLPM by extracting random effect values for participants (best linear unbiased predictors) from a linear mixed effects model capturing changes in response over time for each sex. This is detailed further in Supplemental Methods and Table S4.
Mental health and behavioural outcomes			
• Depressive symptoms (Revised symptom checklist 90, SLC-90-R)			

How often did you experience the following distress or discomfort during the past week?	a) You had little interest in doing things b) You had little appetite c) You felt lonely d) You cried easily, or wanted to cry e) You had difficulty falling asleep, or staying asleep f) You felt depressed or sad g) You were not excited to do anything h) You felt sluggish or weak i) You felt the future was hopeless	1. Never 2. Rarely 3. Sometimes 4. Often	Latent factors (constructs) developed based on measurement invariance model (CFA) outcomes.
• Hostility (Revised symptom checklist 90, SLC-90-R)			
<i>T1 (age 13)</i> How many times in the past seven days have you...	a) Been easily annoyed or irritated? b) Had a tantrum that you could not control? c) Shouted or thrown things? d) Wanted to break things? e) Done something just because you were so angry?	1. Never 2. Rarely 3. Sometimes 4. Often	Latent factors (constructs) developed based on measurement invariance model (CFA) outcomes. Items from T1 were re-ordered to match those at T2 and T3 for measurement invariance testing. T1 c) Shouted or thrown things (T2-3 e) T1 d) Wanted to break things (T2-3 c) T1 e) had no equivalent, but was substituted for T2-3 d)
<i>T2 and 3 (ages 14 and 15)</i> How often did you experience the following distress or discomfort during the past week?	a) It was easy to irritate or annoy you b) You had anger outbursts that you could not control c) You wanted to break or smash things d) You got into arguments e) You shouted or threw things	1. Never 2. Rarely 3. Sometimes 4. Often	
• Conduct disorder (Oregon Adolescent Depression Project Conduct Disorder Screener (OADP-CDS))			
How well or poorly do the following statements apply to you in the past 12 months?	a) I broke rules at home b) I broke rules at school c) I got into fights d) I skipped school e) I ran away from home f) I got in trouble for lying and stealing	1. Rarely/almost never 2. Sometimes/occasionally 3. Quite often or often 4. Almost always or always	Latent factors (constructs) developed based on measurement invariance model (CFA) outcomes.
Screen questions			
• Screen use (daily hours)			
Screen time (T1) How much time do you spend on the following on average per day?	a) Watching movies, shows or videos, b) Being online (e.g., Facebook, Skype, Ask.FM, Snapchat, Instagram, Twitter etc.), c) Play computer games, d) Using computers for purposes other than being online or playing computer games.	1. Nearly no time 2. ½ - 1 hour 3. About 1 hour 4. About 2 hours 5. About 3 hours 6. About 4 hours 7. About 5 hours 8. 6 hours or more	Item responses re-labelled to reflect true number of hours (rounded down), and to ensure distance between responses was not taken equally (i.e., a change from response 2 to 3 reflects a 30-minute increase, but a change from 3 to 4 reflects an hour increase). 1 = 0 (no screen use) 2 = 0.5 (30 minutes) 3 = 1 ... (continues at hourly increments) 8 = 6+ hours
Screen time T2 and 3 (age 14 and 15) How much time do you spend on the following on average per day?	a) Watching movies, shows or videos, b) Playing online computer games, c) Playing computer games that are not online,	1. Nearly no time 2. ½ - 1 hour 3. About 1 hour 4. About 2 hours 5. About 3 hours	T1 items c) and d) were scaled using the proportion of maximum approach (responses / 8).

	d)	Being on social media on the Internet (<i>e.g.</i> , Facebook, Snapchat, Twitter, Instagram, Vine, Tumblr, WhatsApp, Skype, etc.).	6.	About 4 hours	T2 and T3 items b) and c), and e) and f), were summed and scaled using the proportion of maximum approach (sum response score / 16).
	e)	Using the internet for something other than social media or computer games (<i>e.g.</i> , reading news, looking at pictures, or reading text).	7.	About 5 hours	
	f)	Using computers for something other than being online or playing video games (<i>e.g.</i> , studying, writing text, working with images).	8.	6 hours or more	
• Social media use activities					
Social media usage (Multidimensional Scale of Facebook Use (MSFU))	a)	Chat or send messages, pictures or videos,	1.	Never	Exploratory Factor Analysis (EFA) applied to validate grouping of items into active (a, b, c) and passive use (e, f). Latent factors (constructs) developed based on measurement invariance model outcomes using weighted loadings from EFA output.
	b)	Send messages, pictures or videos that disappear after reading,	2.	Once a month or less	
	c)	Post a picture or video of your life.	3.	Once a week	
	d)	Share things other than pictures (<i>e.g.</i> , news, games, websites),	4.	Several times a week	
	e)	Look at your friends' pages/accounts,	5.	Once a day	
	f)	Look at pages/accounts of people you don't know.	6.	2-5 times a day	
			7.	6 times or more a day	

Table S2: Internal consistency (Cronbach's Alpha) of the Parental Social Support score scale across survey years 2017-2019, *reported values are Raw and standardised Cronbach's alpha estimates, mean scores across all five items (not imputed) and standard deviation. Estimates are reported for all participants, and separately for males and females.*

Year	Sex	Raw α	Std. α	Mean	SD
2017	All	0.819	0.827	3.627	0.470
	Males	0.807	0.815	3.574	0.492
	Females	0.827	0.837	3.679	0.442
2018	All	0.872	0.881	3.568	0.554
	Males	0.879	0.885	3.541	0.563
	Females	0.863	0.876	3.593	0.544
2019	All	0.898	0.903	3.558	0.595
	Males	0.906	0.910	3.543	0.614
	Females	0.888	0.897	3.573	0.576

Table S3: Goodness of fit comparison of longitudinal measurement invariance models for depressive symptoms, conduct disorder, parental social support.

Sex	Outcome	Invariance model	CFI (scaled)	TLI (scaled)	RMSEA (scaled)	Chi-squared (scaled)	df
Female	Depressive Symptoms	Configural	0.998 (0.989)	0.998 (0.987)	0.025 (0.034)	548.1 (740.6)	312
		Metric	0.991 (0.974)	0.990 (0.972)	0.057 (0.051)	1610.2 (1349.9)	331
		Scalar	0.984 (0.955)	0.985 (0.959)	0.072 (0.062)	2711.7 (2123.5)	385
		Residual**	0.988 (0.965)	0.989 (0.968)	0.062 (0.054)	2140.7 (1719.6)	385
	Hostility	Configural	0.997 (0.988)	0.997 (0.985)	0.030 (0.042)	171.4 (255.7)	82
		Metric	0.992 (0.981)	0.991 (0.978)	0.050 (0.050)	361.3 (371.0)	93
		Scalar	0.965 (0.928)	0.970 (0.939)	0.089 (0.085)	1276.2 (1169.3)	123
		Residual**	0.000 (0.000)	0.171 (0.127)	0.474 (0.321)	34353.2 (15831.5)	130
	Conduct Problems*	Configural	0.996 (0.985)	0.996 (0.982)	0.016 (0.023)	165.4 (204.2)	126
		Metric	0.997 (0.988)	0.996 (0.986)	0.016 (0.020)	168.6 (192.4)	131
		Scalar	0.977 (0.953)	0.977 (0.954)	0.038 (0.037)	416.6 (402.7)	155
		Residual**	0.957 (0.922)	0.959 (0.925)	0.051 (0.047)	636.0 (570.8)	159
	Parental Social Support	Configural	0.998 (0.992)	0.998 (0.989)	0.032 (0.045)	181.8 (273.1)	82
		Metric	0.987 (0.970)	0.986 (0.966)	0.080 (0.079)	796.3 (773.5)	93
		Scalar	0.983 (0.963)	0.985 (0.968)	0.081 (0.077)	1053.7 (964.6)	122
		Residual**	0.990 (0.977)	0.991 (0.980)	0.062 (0.060)	677.6 (639.9)	122
Male	Depressive Symptoms	Configural	0.998 (0.989)	0.998 (0.988)	0.019 (0.028)	445.2 (597.8)	312

Sex	Outcome	Invariance model	CFI (scaled)	TLI (scaled)	RMSEA (scaled)	Chi-squared (scaled)	df
		Metric	0.993 (0.980)	0.992 (0.979)	0.040 (0.036)	949.9 (848.6)	331
		Scalar	0.992 (0.979)	0.993 (0.981)	0.039 (0.034)	1060.7 (922.9)	385
		Residual**	0.992 (0.979)	0.993 (0.981)	0.039 (0.034)	1064.5 (922.9)	385
	Hostility	Configural	0.996 (0.982)	0.994 (0.977)	0.035 (0.047)	200.0 (293.5)	82
		Metric	0.992 (0.981)	0.991 (0.979)	0.044 (0.045)	302.8 (319.8)	93
		Scalar	0.969 (0.938)	0.974 (0.947)	0.075 (0.071)	946.8 (861.6)	123
		Residual**	0.000 (0.000)	0.174 (0.137)	0.423 (0.288)	27669.7 (12856.7)	130
	Conduct Problems*	Configural	0.982 (0.966)	0.978 (0.959)	0.041 (0.043)	381.9 (396.9)	126
		Metric	0.978 (0.966)	0.974 (0.959)	0.045 (0.042)	427.3 (398.3)	127
		Scalar	0.961 (0.946)	0.961 (0.946)	0.055 (0.049)	697.8 (580.9)	153
		Residual**	0.933 (0.911)	0.935 (0.914)	0.070 (0.061)	1093.5 (866.4)	159
	Parental Social Support	Configural	0.999 (0.994)	0.999 (0.993)	0.023 (0.036)	133.8 (208.6)	82
		Metric	0.987 (0.968)	0.985 (0.964)	0.081 (0.079)	818.3 (786.3)	93
		Scalar	0.986 (0.970)	0.988 (0.974)	0.073 (0.068)	903.5 (788.0)	123
		Residual**	0.991 (0.979)	0.992 (0.982)	0.060 (0.056)	642.4 (577.1)	123

Note: CFI= Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardised root mean residual *Model not truly nested - run only with residual errors fixed within time, in all cases except the passive and active social media models, the residual models resulted in a negative variance-covariance matrix and were disregarded, **Indicates the model used the partial invariance model structure, *** indicates that the models had an adapted intercept model due to an empty response category in the first parental support item in 2017 in females.

Table S4: Parental social support linear mixed effect model estimates *over the study duration (years 2017-2019) and sexes (male and female)*.

	Estimate	Std. Error	df	T value	<i>p</i>
Intercept (2017, Male)	17.849	0.081	4,565	220.737	0.000***
Year: 2018	-0.221	0.086	4,028	-2.586	0.010**
Year: 2019	-0.170	0.084	4,008	-2.020	0.043*
Sex: Female	0.524	0.114	4,542	4.592	0.000***
Year: 2018 : Sex: Female	-0.200	0.120	4,005	-1.670	0.095
Year: 2019 : Sex: Female	-0.339	0.119	3,997	-2.847	0.004***

Table S5: Exploratory Factor Analysis (EFA) factor loadings for the social media usage questions *from the Multidimensional scale of Facebook Use (MSFU)*.

EFA variable loading score	2018		2019	
Survey question	Factor 1	Factor 2	Factor 1	Factor 2
Chat or send messages/pictures/videos	-0.8	-0.13	-0.84	-0.15
Chat or send messages/pictures/videos that disappear after reading	-0.85	-0.16	-0.87	-0.18
Post a picture/video of your life	-0.6	-0.33	-0.58	-0.33
Share things other than pictures (<i>e.g.</i> news, games, websites)	-0.36	-0.31	-0.33	-0.32
Look at your friends' pages/accounts	-0.21	-0.85	-0.19	-0.95
Look at pages/accounts of people you don't know.	-0.2	-0.81	-0.22	-0.78

Table S6: Intraclass correlation (ICC) values for screen use (daily hours) and mental health and behavioural outcomes *reflecting stable differences in average use between participants*.

	Unadjusted ICC (%)	
	Male	Female
Screen use (daily hours)		
Social media	29.0	38.5
Watching videos	34.1	44.4
Gaming	44.1	53.6
Other screen use	15.3	20.5
Outcomes		
Conduct problems	35.8	37.1
Hostility	47.1	50.5
Depressive symptoms	47.6	52.2

Table S7: Model fit statistics of the Random-Slope – Random-Intercept Models presented grouped by outcome, screen use activity and sex.

Fit statistics						
Outcome	Screen type	Sex	CFI	TLI	RMSEA	SRMR
Depressive symptoms	SMU	Male	1	0.997	0.014	0.007
		Female	1	0.997	0.014	0.007
	VW	Male	1	1.004	0	0.006
		Female	1	1.004	0	0.006
	VG †	Male	1	0.999	0.01	0.006
		Female	1	0.999	0.01	0.006
Hostility	SMU	Male	1	1.003	0	0.004
		Female	1	1.003	0	0.004
	VW	Male	1	1	0.005	0.008
		Female	1	1	0.005	0.008
	VG †	Male	1	1.004	0	0.003
		Female	1	1.004	0	0.003
Conduct problems†	SMU †	Male	1	0.998	0.011	0.005
		Female	1	0.998	0.011	0.005
	VW †	Male	1	0.997	0.017	0.007
		Female	1	0.997	0.017	0.007
	VG †	Male	1	1.003	0	0.002
		Female	1	1.003	0	0.002

Notes: Goodness of model fit is evaluated by Comparative Fit Index (CFI, recommended >0.95), Tucker Lewis Index (TLI, recommended >0.95), Root Mean Square Error (RMSEA, recommended <0.08), Standardised Root Mean Squared Residual (SRMR, recommended <0.08). † indicates models that did not converge.

Table S8: Model estimates from the Random-Slope – Random-Intercept Models. Also presented are standard errors (SE) and p values. Results are presented sequentially for models testing the relationships between mental health and behaviour outcomes and daily hours spent on social media (SMU), video watching (VW) and video gaming (VG). Separate models were run for males and females and results are presented separately. The first row provides questions to help with the interpretation of the various presented interactions of model parameters.

							Are people who are stable-high on outcome also stable-high on screen use?		Do trajectories of outcome and screen use move together across development?		Do people who start higher on the outcome/screen tend to increase more? (within construct)				Does starting level of the outcome/screen use predict how screen use/outcome changes over time? (cross-construct)			
			RS variance (outcome)		RS variance (screen)		RI-RI correlation		RS-RS correlation		Outcome: baseline - trajectory		Screen use: baseline - trajectory		Outcome baseline - screen use trajectory		Screen use baseline - outcome trajectory	
Outcome	Screen type	Sex	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p
Depressive symptoms	SMU	Male	0.063 (0.012)	< .001	0.359 (0.084)	< .001	0.237 (0.063)	< .001	0.144 (0.098)	0.141	-0.215 (0.062)	< .001	-0.514 (0.092)	< .001	-0.125 (0.075)	0.099	-0.112 (0.075)	0.135
		Female	0.08 (0.013)	< .001	0.429 (0.069)	< .001	0.171 (0.06)	0.005	0.049 (0.071)	0.485	-0.214 (0.058)	< .001	-0.215 (0.091)	0.018	0.064 (0.062)	0.296	0.086 (0.074)	0.245
	VW	Male	0.064 (0.011)	< .001	0.216 (0.075)	0.004	0.243 (0.062)	< .001	0.019 (0.12)	0.875	-0.213 (0.062)	< .001	-0.578 (0.086)	< .001	0.004 (0.093)	0.969	-0.048 (0.072)	0.507
		Female	0.08 (0.013)	< .001	0.178 (0.065)	0.006	0.237 (0.057)	< .001	0.057 (0.1)	0.573	-0.213 (0.058)	< .001	-0.191 (0.134)	0.155	0.164 (0.091)	0.072	0.043 (0.065)	0.508
	VG †	Male	0.061 (0.012)	< .001	0.001 (0.001)	0.577	0.22 (0.063)	< .001	0.689 (0.647)	0.287	-0.204 (0.063)	0.001	-0.95 (0.54)	0.078	-0.29 (0.314)	0.355	-0.169 (0.076)	0.026
		Female	0.077 (0.013)	< .001	0 (0.001)	0.584	0.071 (0.054)	0.193	-0.078 (0.192)	0.685	-0.205 (0.06)	< .001	-0.481 (0.203)	0.018	0.251 (0.271)	0.353	0.09 (0.069)	0.196
Hostility	SMU	Male	0.086 (0.011)	< .001	0.369 (0.08)	< .001	0.211 (0.052)	< .001	0.137 (0.076)	0.070	-0.349 (0.039)	< .001	-0.52 (0.087)	< .001	-0.013 (0.059)	0.830	-0.077 (0.068)	0.253

			Are people who are stable-high on outcome also stable-high on screen use?				Do trajectories of outcome and screen use move together across development?				Do people who start higher on the outcome/screen tend to increase more? (within construct)				Does starting level of the outcome/screen use predict how screen use/outcome changes over time? (cross-construct)			
			RS variance (outcome)		RS variance (screen)		RI-RI correlation		RS-RS correlation		Outcome: baseline - trajectory		Screen use: baseline - trajectory		Outcome baseline - screen use trajectory		Screen use baseline - outcome trajectory	
Outcome	Screen type	Sex	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p
Hostility	VW	Female	0.081 (0.01)	< .001	0.439 (0.065)	< .001	0.234 (0.052)	< .001	0.108 (0.065)	0.097	-0.317 (0.041)	< .001	-0.222 (0.086)	0.010	0.067 (0.058)	0.247	0.01 (0.066)	0.875
		Male	0.087 (0.011)	< .001	0.219 (0.076)	0.004	0.142 (0.048)	0.003	-0.011 (0.098)	0.914	-0.352 (0.039)	< .001	-0.573 (0.086)	< .001	0.067 (0.075)	0.371	-0.02 (0.061)	0.747
	VG †	Female	0.081 (0.01)	< .001	0.188 (0.064)	0.004	0.275 (0.049)	< .001	0.046 (0.087)	0.593	-0.318 (0.041)	< .001	-0.186 (0.131)	0.156	0.089 (0.074)	0.227	-0.05 (0.058)	0.389
		Male	0.087 (0.011)	< .001	0.001 (0.001)	0.615	0.152 (0.054)	0.005	0.414 (0.464)	0.373	-0.351 (0.039)	< .001	-0.976 (0.641)	0.128	-0.134 (0.226)	0.553	-0.095 (0.063)	0.130
		Female	0.08 (0.011)	< .001	0 (0.001)	0.532	0.18 (0.058)	0.002	-0.01 (0.14)	0.945	-0.315 (0.042)	< .001	-0.471 (0.192)	0.014	0.032 (0.117)	0.787	-0.017 (0.067)	0.804
		Male	0.111 (0.01)	< .001	0.358 (0.081)	< .001	0.245 (0.052)	< .001	0.103 (0.071)	0.148	-0.439 (0.029)	< .001	-0.52 (0.089)	< .001	-0.005 (0.059)	0.936	-0.054 (0.061)	0.372
Conduct problems	SMU †	Female	0.051 (0.007)	< .001	0.453 (0.066)	< .001	0.323 (0.053)	< .001	0.177 (0.062)	0.004	-0.228 (0.041)	< .001	-0.225 (0.084)	0.007	0.022 (0.053)	0.669	-0.114 (0.063)	0.070
		Male	0.114 (0.01)	< .001	0.205 (0.076)	0.007	0.056 (0.053)	0.289	0.006 (0.096)	0.950	-0.442 (0.029)	< .001	-0.573 (0.089)	< .001	0.041 (0.083)	0.616	0.003 (0.06)	0.963
	VW †	Male	0.114 (0.01)	< .001	0.205 (0.076)	0.007	0.056 (0.053)	0.289	0.006 (0.096)	0.950	-0.442 (0.029)	< .001	-0.573 (0.089)	< .001	0.041 (0.083)	0.616	0.003 (0.06)	0.963
		Female	0.051 (0.007)	< .001	0.19 (0.065)	0.004	0.155 (0.048)	0.001	-0.012 (0.09)	0.892	-0.228 (0.04)	< .001	-0.193 (0.13)	0.139	0.095 (0.077)	0.216	0.044 (0.066)	0.501

			Are people who are stable-high on outcome also stable-high on screen use?				Do trajectories of outcome and screen use move together across development?				Do people who start higher on the outcome/screen tend to increase more? (within construct)				Does starting level of the outcome/screen use predict how screen use/outcome changes over time? (cross-construct)			
			RS variance (outcome)		RS variance (screen)		RI-RI correlation		RS-RS correlation		Outcome: baseline - trajectory		Screen use: baseline - trajectory		Outcome baseline - screen use trajectory		Screen use baseline - outcome trajectory	
Outcome	Screen type	Sex	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p
	VG †	Male	0.114 (0.01)	< .001	0.001 (0.001)	0.618	0.036 (0.053)	0.496	0.125 (0.231)	0.589	-0.442 (0.029)	< .001	-0.98 (0.65)	0.132	0.09 (0.204)	0.658	0.016 (0.057)	0.784
		Female	0.052 (0.007)	< .001	0 (0.001)	0.538	0.11 (0.051)	0.030	-0.038 (0.152)	0.803	-0.229 (0.04)	< .001	-0.473 (0.192)	0.014	0.059 (0.113)	0.605	0.092 (0.074)	0.212

Table S9: Model fit statistics of the Random Intercept Cross Lagged Panel Models (RI-CLPM) selected by the AIC weights procedure, and the CLPM selected by pairwise comparison (in all cases the fully free CLPM with sex grouping), presented grouped by outcome, model method and screen use activity.

Outcome	Model method	Screen type	Model specification	Sex	df	CFI	TLI	RMSEA	SRMR
Depressive symptoms	RI-CLPM	Social media use (SMU)	Constrained CL Depressive symptoms → SMU	Male	7	0.993	0.968	0.043	0.017
			Constrained CL Depressive symptoms → SMU	Female	7	0.987	0.938	0.067	0.024
		Video watching (VW)	Constrained CL Depressive symptoms → VW	Male	7	0.997	0.984	0.032	0.012
			Constrained CL Depressive symptoms → VW	Female	7	0.988	0.942	0.066	0.021
		Video gaming (VG)	Constrained CL Depressive symptoms → VW	Male	7	1.000	1.000	0.000	0.010
			Constrained CL Depressive symptoms → VW	Female	7	0.999	0.999	0.000	0.010

Outcome	Model method	Screen type	Model specification	Sex	df	CFI	TLI	RMSEA	SRMR
Hostility	CLPM	Active-Passive SMU	Constrained AR VW	Female	7	0.996	0.980	0.039	0.013
			Fully free	Mixed	12	0.998	0.989	0.033	0.018
			Online-Offline VG	Mixed	12	0.995	0.970	0.040	0.019
	RI-CLPM	Social media use (SMU)	Fully constrained	Male	10	0.994	0.980	0.036	0.019
			Constrained CL Hostility → SMU	Female	7	0.990	0.954	0.062	0.023
		Video watching (VW)	Constrained CL VW → Hostility	Male	7	0.997	0.987	0.029	0.013
			Fully constrained	Female	10	0.990	0.965	0.054	0.021
		Video gaming (VG)	Constrained CL Hostility → VG	Male	7	1.000	1.008	0.000	0.005
			Fully constrained	Female	10	0.998	0.994	0.023	0.011
		CLPM	Active-Passive SMU	Mixed	12	0.999	0.996	0.021	0.014
			Online-Offline VG	Mixed	12	0.997	0.985	0.028	0.014
Conduct problems	RI-CLPM	Social media use (SMU)	Fully constrained	Male	10	0.994	0.980	0.036	0.019
			Constrained CL Conduct problems → SMU	Female	7	0.991	0.958	0.064	0.023
		Video watching (VW)	Constrained CL VW → Conduct problems	Male	7	0.998	0.989	0.027	0.011
			Constrained CL Conduct problems → VW	Female	7	0.993	0.966	0.058	0.019
		Video gaming (VG)	Constrained CL VG → Conduct problems	Male	7	1.000	1.007	0.000	0.004
			Fully constrained	Female	10	0.998	0.993	0.027	0.013
	CLPM	Active-Passive SMU	Fully free	Mixed	12	0.999	0.997	0.019	0.013
		Online-Offline VG	Fully free	Mixed	12	0.998	0.987	0.027	0.014

Notes: Goodness of model fit is evaluated by Comparative Fit Index (CFI, recommended >0.95), Tucker Lewis Index (TLI, recommended >0.95), Root Mean Square Error (RMSEA, recommended <0.08), Standardised Root Mean Squared Residual (SRMR, recommended <0.08).

Table S10: Model fit statistics of the fully-free (unconstrained) Random Intercept Cross Lagged Panel Models (RI-CLPM)

Outcome	Screen type	Sex	df	CFI	TLI	RMSEA	SRMR
Depressive symptoms	Social media use (SMU)	Male	6	0.993	0.961	0.048	0.017
		Female	6	0.987	0.929	0.072	0.024
	Video watching (VW)	Male	6	0.996	0.979	0.036	0.013
		Female	6	0.987	0.930	0.072	0.021
	Video gaming (VG)	Male	6	1.000	1.002	0.000	0.007
		Female	6	0.996	0.977	0.042	0.012
Hostility	Social media use (SMU)	Male	6	0.994	0.966	0.046	0.017
		Female	6	0.990	0.944	0.068	0.023
	Video watching (VW)	Male	6	0.997	0.983	0.033	0.013
		Female	6	0.990	0.947	0.067	0.020
	Video gaming (VG)	Male	6	1.000	1.007	0.000	0.005
		Female	6	0.998	0.988	0.033	0.010
Conduct problems	Social media use (SMU)	Male	6	0.995	0.972	0.043	0.016
		Female	6	0.991	0.950	0.070	0.023
	Video watching (VW)	Male	6	0.997	0.985	0.032	0.011
		Female	6	0.992	0.959	0.064	0.019
	Video gaming (VG)	Male	6	1.000	1.006	0.000	0.004
		Female	6	0.998	0.989	0.033	0.011

Notes: Goodness of model fit is evaluated by Comparative Fit Index (CFI, recommended >0.95), Tucker Lewis Index (TLI, recommended >0.95), Root Mean Square Error (RMSEA, recommended <0.08), Standardised Root Mean Squared Residual (SRMR, recommended <0.08).

Table S11: Depressive symptom Random Intercept Cross Lagged Panel Models (RI-CLPM) standardised model estimates from models favoured by the AIC weights procedure. Also presented are 95% Confidence intervals (CI) and p values. Results are presented sequentially for models testing the relationships between depressive symptom outcomes and daily hours spent video gaming, on social media and video watching. Values in bold indicate significant interactions exceeding the Bonferroni corrected significance threshold. Separate models were run for males and females and results are presented separately.

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
Video gaming (VG)	Autoregressive paths	Depressive symptoms (T1) → Depressive symptoms (T2)	0.165	0.034 to 0.295	0.013	0.220	0.072 to 0.367	0.003
		Depressive symptoms (T2) → Depressive symptoms (T3)	0.413	0.299 to 0.526	<0.001	0.478	0.374 to 0.582	<0.001
		VG (T1) → VG (T2)	0.145	0.020 to 0.269	0.023			
		VG (T2) → VG (T3)	-0.199	-0.431 to 0.032	0.091			
		VG → VG (time invariant)				0.157	-0.121 to 0.436	0.268
	Cross-lagged paths	Depressive symptoms (T1) → VG (T2)				-0.058	-0.181 to 0.065	0.353
		Depressive symptoms (T2) → VG (T3)				0.094	-0.050 to 0.237	0.203
		Depressive symptoms → VG (time invariant)	0.058	-0.042 to 0.158	0.255			

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
		VG (T1) → Depressive symptoms (T2)	0.098	0.004 to 0.192	0.040	-0.044	-0.138 to 0.051	0.363
		VG (T2) → Depressive symptoms (T3)	-0.019	-0.134 to 0.096	0.746	0.040	-0.048 to 0.129	0.372
	Random Intercept correlation	Depressive symptoms RI ↔ VG RI	0.140	0.031 to 0.249	0.012	0.219	0.092 to 0.346	<0.001
	Contemporaneous correlations	Depressive symptoms ↔ VG (T1)	0.107	0.014 to 0.199	0.024	-0.004	-0.109 to 0.100	0.938
		Depressive symptoms ↔ VG (T2)	0.105	0.007 to 0.203	0.037	0.107	0.014 to 0.199	0.023
		Depressive symptoms ↔ VG (T3)	0.113	0.009 to 0.218	0.034	0.118	0.013 to 0.223	0.028
	Regression with controls	Language → Depressive symptoms (T1)	0.085	0.038 to 0.132	<0.001	0.029	-0.017 to 0.075	0.220
		Language → Depressive symptoms (T2)	0.061	0.016 to 0.105	0.008	0.046	0.001 to 0.091	0.044
		Language → Depressive symptoms (T3)	0.050	0.005 to 0.094	0.028	0.060	0.015 to 0.106	0.009
		Language → VG (T1)	0.145	0.095 to 0.195	<0.001	0.087	0.031 to 0.143	0.002
		Language → VG (T2)	0.110	0.050 to 0.171	<0.001	0.084	0.021 to 0.146	0.009
		Language → VG (T3)	0.086	0.027 to 0.144	0.004	0.078	0.016 to 0.141	0.014

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
		Parental support → Depressive symptoms (T1)	-0.325	-0.380 to -0.270	<0.001	-0.396	-0.444 to -0.347	<0.001
		Parental support → Depressive symptoms (T2)	-0.331	-0.386 to -0.276	<0.001	-0.399	-0.447 to -0.351	<0.001
		Parental support → Depressive symptoms (T3)	-0.386	-0.440 to -0.331	<0.001	-0.402	-0.450 to -0.354	<0.001
		Parental support → VG (T1)	-0.148	-0.215 to -0.081	<0.001	-0.127	-0.195 to -0.060	<0.001
		Parental support → VG (T2)	-0.181	-0.253 to -0.110	<0.001	-0.129	-0.193 to -0.065	<0.001
		Parental support → VG (T3)	-0.181	-0.251 to -0.112	<0.001	-0.150	-0.230 to -0.071	<0.001
		Two-parent household → Depressive symptoms (T1)	-0.064	-0.117 to -0.012	0.016	-0.046	-0.096 to 0.004	0.074
		Two-parent household → Depressive symptoms (T2)	-0.081	-0.133 to -0.029	0.002	-0.047	-0.099 to 0.005	0.074
		Two-parent household → Depressive symptoms (T3)	-0.116	-0.168 to -0.065	<0.001	-0.045	-0.097 to 0.006	0.085
		Two-parent household → Gaming (T1)	-0.086	-0.141 to -0.031	0.002	-0.024	-0.086 to 0.038	0.453
		Two-parent household → Gaming (T2)	-0.069	-0.132 to -0.005	0.033	0.003	-0.061 to 0.066	0.937
		Two-parent household → Gaming (T3)	-0.064	-0.124 to -0.004	0.035	-0.026	-0.093 to 0.041	0.450

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
Social media use (SMU)	Autoregressive paths	Depressive symptoms (T1) → Depressive symptoms (T2)	0.187	0.056 to 0.318	0.005	0.238	0.092 to 0.383	0.001
		Depressive symptoms (T2) → Depressive symptoms (T3)	0.429	0.317 to 0.540	<0.001	0.478	0.371 to 0.584	<0.001
		SMU (T1) → SMU (T2)	0.271	0.109 to 0.432	0.001	0.191	0.013 to 0.369	0.035
		SMU (T2) → SMU (T3)	0.263	0.140 to 0.386	<0.001	0.461	0.368 to 0.554	<0.001
	Cross-lagged paths	Depressive symptoms → SMU (time invariant)	-0.020	-0.105 to 0.066	0.652	0.041	-0.035 to 0.117	0.292
		SMU (T1) → Depressive symptoms (T2)	0.110	0.005 to 0.214	0.039	-0.073	-0.183 to 0.036	0.189
		SMU (T2) → Depressive symptoms (T3)	-0.039	-0.135 to 0.057	0.423	0.060	-0.012 to 0.133	0.103
	Random Intercept correlation	Depressive symptoms RI ↔ SMU RI	0.247	0.001 to 0.494	0.049	0.346	0.170 to 0.523	<0.001
	Contemporaneous correlations	Depressive symptoms ↔ SMU (T1)	-0.000	-0.122 to 0.122	0.995	0.098	-0.027 to 0.223	0.124
		Depressive symptoms ↔ SMU (T2)	0.088	0.014 to 0.162	0.020	0.097	0.040 to 0.154	<0.001
		Depressive symptoms ↔ SMU (T3)	0.095	0.015 to 0.174	0.020	0.119	0.048 to 0.190	0.001
	Regression with controls	Language → Depressive symptoms (T1)	0.085	0.038 to 0.132	<0.001	0.031	-0.015 to 0.078	0.184

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
		Language → Depressive symptoms (T2)	0.060	0.015 to 0.105	0.009	0.049	0.004 to 0.094	0.034
		Language → Depressive symptoms (T3)	0.049	0.005 to 0.094	0.030	0.063	0.017 to 0.108	0.007
		Language → SMU (T1)	-0.017	-0.077 to 0.043	0.572	-0.042	-0.100 to 0.015	0.151
		Language → SMU (T2)	0.034	-0.020 to 0.089	0.219	0.058	0.002 to 0.113	0.042
		Language → SMU (T3)	0.075	0.022 to 0.128	0.006	0.099	0.047 to 0.152	<0.001
		Parental support → Depressive symptoms (T1)	-0.326	-0.381 to -0.270	<0.001	-0.395	-0.444 to -0.347	<0.001
		Parental support → Depressive symptoms (T2)	-0.330	-0.385 to -0.276	<0.001	-0.399	-0.447 to -0.351	<0.001
		Parental support → Depressive symptoms (T3)	-0.386	-0.440 to -0.331	<0.001	-0.402	-0.450 to -0.355	<0.001
		Parental support → SMU (T1)	-0.047	-0.110 to 0.017	0.149	-0.146	-0.212 to -0.079	<0.001
		Parental support → SMU (T2)	-0.011	-0.085 to 0.063	0.764	-0.074	-0.141 to -0.006	0.032
		Parental support → SMU (T3)	-0.012	-0.085 to 0.062	0.755	-0.116	-0.183 to -0.050	<0.001
		Two-parent household → Depressive symptoms (T1)	-0.065	-0.117 to -0.012	0.015	-0.044	-0.094 to 0.006	0.083

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
Video watching (VW)	Autoregressive paths	Two-parent household → Depressive symptoms (T2)	-0.081	-0.133 to -0.029	0.002	-0.046	-0.098 to 0.006	0.083
		Two-parent household → Depressive symptoms (T3)	-0.117	-0.168 to -0.065	<0.001	-0.044	-0.096 to 0.008	0.095
		Two-parent household → SMU (T1)	-0.085	-0.145 to -0.025	0.006	-0.129	-0.191 to -0.067	<0.001
		Two-parent household → SMU (T2)	-0.007	-0.070 to 0.056	0.833	-0.083	-0.145 to -0.021	0.009
		Two-parent household → SMU (T3)	-0.026	-0.087 to 0.036	0.414	-0.052	-0.114 to 0.010	0.098
	Cross-lagged paths	Depressive symptoms (T1) → Depressive symptoms (T2)	0.188	0.061 to 0.316	0.004	0.237	0.092 to 0.382	0.001
		Depressive symptoms (T2) → Depressive symptoms (T3)	0.430	0.322 to 0.537	<0.001	0.490	0.388 to 0.591	<0.001
		VW (T1) → VW (T2)	0.217	0.088 to 0.347	0.001	0.106	-0.061 to 0.273	0.212
		VW (T2) → VW (T3)	0.096	-0.028 to 0.220	0.131	0.240	0.117 to 0.363	<0.001
		Depressive symptoms → VW (time invariant)	-0.017	-0.104 to 0.069	0.695	0.044	-0.037 to 0.125	0.292
		VW (T1) → Depressive symptoms (T2)	-0.013	-0.114 to 0.087	0.795	-0.082	-0.192 to 0.028	0.143
		VW (T2) → Depressive symptoms (T3)	-0.071	-0.165 to 0.024	0.143	0.054	-0.016 to 0.123	0.128

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
	Random Intercept correlation	Depressive symptoms RI ↔ VW RI	0.399	0.230 to 0.568	<0.001	0.407	0.277 to 0.538	<0.001
	Contemporaneous correlations	Depressive symptoms ↔ VW (T1)	0.018	-0.096 to 0.133	0.752	-0.025	-0.150 to 0.101	0.698
		Depressive symptoms ↔ VW (T2)	0.057	-0.015 to 0.130	0.121	0.134	0.072 to 0.196	<0.001
		Depressive symptoms ↔ VW (T3)	0.061	-0.016 to 0.138	0.120	0.154	0.082 to 0.226	<0.001
	Regression with controls	Language → Depressive symptoms (T1)	0.085	0.038 to 0.132	<0.001	0.036	-0.010 to 0.083	0.126
		Language → Depressive symptoms (T2)	0.060	0.016 to 0.105	0.008	0.054	0.008 to 0.099	0.020
		Language → Depressive symptoms (T3)	0.050	0.005 to 0.094	0.029	0.068	0.022 to 0.113	0.004
		Language → VW (T1)	0.031	-0.025 to 0.087	0.281	0.013	-0.050 to 0.076	0.681
		Language → VW (T2)	0.115	0.061 to 0.169	<0.001	0.106	0.051 to 0.161	<0.001
		Language → VW (T3)	0.093	0.040 to 0.146	<0.001	0.129	0.072 to 0.185	<0.001
		Parental support → Depressive symptoms (T1)	-0.326	-0.381 to -0.271	<0.001	-0.396	-0.444 to -0.347	<0.001
		Parental support → Depressive symptoms (T2)	-0.330	-0.385 to -0.276	<0.001	-0.398	-0.446 to -0.350	<0.001

Depressive symptoms			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	p value	Std. estimate (β)	95% CI	p value
		Parental support → Depressive symptoms (T3)	-0.385	-0.440 to -0.331	<0.001	-0.402	-0.449 to -0.354	<0.001
		Parental support → VW (T1)	-0.104	-0.169 to -0.040	0.002	-0.136	-0.202 to -0.071	<0.001
		Parental support → VW (T2)	-0.112	-0.188 to -0.037	0.004	-0.085	-0.150 to -0.019	0.011
		Parental support → VW (T3)	-0.104	-0.173 to -0.035	0.003	-0.112	-0.176 to -0.049	<0.001
		Two-parent household → Depressive symptoms (T1)	-0.065	-0.117 to -0.012	0.016	-0.042	-0.092 to 0.008	0.102
		Two-parent household → Depressive symptoms (T2)	-0.081	-0.133 to -0.029	0.002	-0.043	-0.095 to 0.008	0.101
		Two-parent household → Depressive symptoms (T3)	-0.116	-0.168 to -0.065	<0.001	-0.042	-0.094 to 0.010	0.115
		Two-parent household → VW (T1)	-0.078	-0.135 to -0.020	0.008	-0.080	-0.139 to -0.020	0.009
		Two-parent household → VW (T2)	-0.061	-0.123 to 0.001	0.054	-0.052	-0.115 to 0.012	0.112
		Two-parent household → VW (T3)	-0.011	-0.071 to 0.049	0.724	-0.044	-0.105 to 0.017	0.162

Table S12: Hostility Random Intercept Cross Lagged Panel Models (RI-CLPM) standardised model estimates from models favoured by the AIC weights procedure. Also presented are 95% Confidence intervals (CI) and p values. Results are presented sequentially for models testing the relationships between depressive symptom outcomes and daily hours spent video gaming, on social media and video watching. Values in bold indicate significant interactions exceeding the Bonferroni corrected significance threshold. Separate models were run for males and females and results are presented separately.

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Video gaming (VG)	Autoregressive paths	VG (T1) → VG (T2)	0.138	0.012 to 0.263	0.032			
		VG (T2) → VG (T3)	-0.211	-0.436 to 0.014	0.066			
		VG → VG (time invariant)				0.170	-0.110 to 0.450	0.235
		Hostility (T1) → Hostility (T2)	0.504	0.369 to 0.639	<0.001			
		Hostility (T2) → Hostility (T3)	0.549	0.430 to 0.668	<0.001			
	Cross-lagged paths	Hostility (T1) → VG (T2)	0.087	-0.038 to 0.211	0.173			
		Hostility (T2) → VG (T3)	0.081	-0.094 to 0.256	0.366			
		Hostility → VG (time invariant)				-0.021	-0.155 to 0.114	0.764
	Random Intercept correlation	Hostility RI ↔ VG RI	0.125	-0.018 to 0.269	0.088	0.284	0.123 to 0.445	<0.001
	Contemporaneous correlations	Hostility ↔ VG (T1)	0.069	-0.035 to 0.173	0.193	0.044	-0.082 to 0.170	0.495

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Hostility ↔ VG (T2)	0.144	0.026 to 0.262	0.017	0.055	-0.040 to 0.149	0.258
		Hostility ↔ VG (T3)	0.150	0.026 to 0.275	0.018	0.057	-0.042 to 0.157	0.259
	Regression with controls	Language → VG (T1)	0.144	0.094 to 0.194	<0.001	0.083	0.026 to 0.140	0.004
		Language → VG (T2)	0.109	0.048 to 0.170	<0.001	0.078	0.015 to 0.142	0.016
		Language → VG (T3)	0.085	0.027 to 0.144	0.004	0.073	0.009 to 0.137	0.025
		Language → Hostility (T1)	0.052	0.003 to 0.102	0.039	0.045	-0.009 to 0.099	0.100
		Language → Hostility (T2)	0.037	-0.011 to 0.086	0.129	0.048	-0.004 to 0.100	0.073
		Language → Hostility (T3)	0.025	-0.023 to 0.072	0.306	0.066	0.013 to 0.120	0.015
		Parental support → VG (T1)	-0.150	-0.216 to -0.083	<0.001	-0.128	-0.195 to -0.060	<0.001
		Parental support → VG (T2)	-0.181	-0.253 to -0.110	<0.001	-0.130	-0.194 to -0.066	<0.001
		Parental support → VG (T3)	-0.183	-0.253 to -0.114	<0.001	-0.153	-0.232 to -0.073	<0.001
		Parental support → Hostility (T1)	-0.230	-0.285 to -0.174	<0.001	-0.311	-0.364 to -0.259	<0.001

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Parental support → Hostility (T2)	-0.234	-0.290 to -0.177	<0.001	-0.351	-0.402 to -0.301	<0.001
		Parental support → Hostility (T3)	-0.236	-0.294 to -0.178	<0.001	-0.361	-0.412 to -0.310	<0.001
		Two-parent household → VG (T1)	-0.084	-0.139 to -0.029	0.003	-0.026	-0.089 to 0.036	0.414
		Two-parent household → VG (T2)	-0.068	-0.131 to -0.004	0.036	-0.000	-0.065 to 0.065	0.993
		Two-parent household → VG (T3)	-0.064	-0.124 to -0.004	0.037	-0.028	-0.097 to 0.040	0.417
		Two-parent household → Hostility (T1)	-0.082	-0.136 to -0.028	0.003	-0.017	-0.073 to 0.038	0.548
		Two-parent household → Hostility (T2)	-0.072	-0.125 to -0.019	0.008	-0.022	-0.076 to 0.032	0.421
		Two-parent household → Hostility (T3)	-0.092	-0.146 to -0.039	<0.001	-0.022	-0.076 to 0.033	0.433
Social media use (SMU)	Autoregressive paths	Hostility (T1) → Hostility (T2)				0.471	0.341 to 0.600	<0.001
		Hostility (T2) → Hostility (T3)				0.565	0.459 to 0.671	<0.001
		SMU (T1) → SMU (T2)				0.214	0.051 to 0.377	0.010
		SMU (T2) → SMU (T3)				0.471	0.382 to 0.560	<0.001

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		SMU → SMU (time invariant)	0.238	0.128 to 0.349	<0.001			
	Cross-lagged paths	Hostility → SMU (time invariant)	0.052	-0.035 to 0.139	0.238	0.065	-0.015 to 0.145	0.110
		SMU (T1) → Hostility (T2)				-0.058	-0.153 to 0.036	0.229
		SMU (T2) → Hostility (T3)				0.036	-0.036 to 0.107	0.333
	Random Intercept correlation	Hostility RI ↔ SMU RI	0.388	0.066 to 0.710	0.018	0.432	0.224 to 0.641	<0.001
	Contemporaneous correlations	Hostility ↔ SMU (T1)	0.025	-0.123 to 0.173	0.742	0.056	-0.090 to 0.202	0.452
		Hostility ↔ SMU (T2)	0.190	0.110 to 0.270	<0.001	0.179	0.113 to 0.245	<0.001
		Hostility ↔ SMU (T3)	0.197	0.113 to 0.280	<0.001	0.214	0.133 to 0.295	<0.001
	Regression with controls	Language → Hostility (T1)	0.058	0.009 to 0.107	0.020	0.056	0.001 to 0.110	0.044
		Language → Hostility (T2)	0.043	-0.004 to 0.091	0.076	0.058	0.005 to 0.111	0.030
		Language → Hostility (T3)	0.031	-0.017 to 0.078	0.201	0.076	0.023 to 0.130	0.005
		Language → SMU (T1)	-0.018	-0.078 to 0.042	0.562	-0.042	-0.099 to 0.016	0.156

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → SMU (T2)	0.035	-0.020 to 0.090	0.212	0.058	0.003 to 0.113	0.037
		Language → SMU (T3)	0.077	0.024 to 0.130	0.004	0.100	0.048 to 0.153	<0.001
		Parental support → Hostility (T1)	-0.229	-0.284 to -0.173	<0.001	-0.310	-0.363 to -0.258	<0.001
		Parental support → Hostility (T2)	-0.231	-0.287 to -0.176	<0.001	-0.352	-0.404 to -0.301	<0.001
		Parental support → Hostility (T3)	-0.237	-0.296 to -0.179	<0.001	-0.359	-0.411 to -0.308	<0.001
		Parental support → SMU (T1)	-0.047	-0.111 to 0.016	0.144	-0.148	-0.215 to -0.082	<0.001
		Parental support → SMU (T2)	-0.008	-0.083 to 0.066	0.832	-0.073	-0.140 to -0.006	0.033
		Parental support → SMU (T3)	-0.012	-0.085 to 0.061	0.745	-0.117	-0.183 to -0.051	<0.001
		Two-parent household → Hostility (T1)	-0.079	-0.133 to -0.025	0.004	-0.012	-0.067 to 0.044	0.677
		Two-parent household → Hostility (T2)	-0.068	-0.121 to -0.015	0.011	-0.017	-0.071 to 0.037	0.533
		Two-parent household → Hostility (T3)	-0.089	-0.143 to -0.036	0.001	-0.017	-0.071 to 0.038	0.549
		Two-parent household → SMU (T1)	-0.081	-0.141 to -0.021	0.008	-0.128	-0.189 to -0.066	<0.001

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Video watching (VW)		Two-parent household → SMU (T2)	-0.007	-0.070 to 0.057	0.838	-0.082	-0.143 to -0.020	0.010
		Two-parent household → SMU (T3)	-0.026	-0.087 to 0.035	0.402	-0.051	-0.113 to 0.011	0.104
	Autoregressive paths	Hostility (T1) → Hostility (T2)	0.522	0.387 to 0.656	<0.001			
		Hostility (T2) → Hostility (T3)	0.563	0.446 to 0.681	<0.001			
		VW (T1) → VW (T2)	0.220	0.089 to 0.351	<0.001			
		VW (T2) → VW (T3)	0.104	-0.018 to 0.226	0.095			
		Video watching → VW (time invariant)				0.196	0.089 to 0.303	<0.001
	Cross-lagged paths	Hostility (T1) → VW (T2)	-0.050	-0.174 to 0.075	0.433			
		Hostility (T2) → VW (T3)	0.006	-0.109 to 0.121	0.915			
		Hostility → VW (time invariant)				0.035	-0.060 to 0.129	0.469
	Random Intercept correlation	Hostility RI ↔ VW RI	0.402	0.153 to 0.651	0.002	0.416	0.258 to 0.573	<0.001
	Contemporaneous correlations	Hostility ↔ VW (T1)	-0.026	-0.163 to 0.110	0.704	0.085	-0.040 to 0.209	0.182

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Hostility ↔ VW (T2)	0.025	-0.060 to 0.111	0.566	0.148	0.068 to 0.227	<0.001
		Hostility ↔ VW (T3)	0.025	-0.061 to 0.112	0.567	0.159	0.073 to 0.246	<0.001
	Regression with controls	Language → Hostility (T1)	0.053	0.003 to 0.102	0.037	0.049	-0.005 to 0.103	0.078
		Language → Hostility (T2)	0.038	-0.011 to 0.086	0.126	0.051	-0.001 to 0.104	0.056
		Language → Hostility (T3)	0.025	-0.022 to 0.072	0.299	0.070	0.016 to 0.123	0.011
		Language → VW (T1)	0.030	-0.026 to 0.086	0.300	0.011	-0.052 to 0.074	0.729
		Language → VW (T2)	0.113	0.059 to 0.166	<0.001	0.102	0.048 to 0.157	<0.001
		Language → VW (T3)	0.092	0.039 to 0.146	<0.001	0.128	0.071 to 0.186	<0.001
		Parental support → Hostility (T1)	-0.230	-0.286 to -0.174	<0.001	-0.311	-0.364 to -0.259	<0.001
		Parental support → Hostility (T2)	-0.234	-0.290 to -0.177	<0.001	-0.350	-0.401 to -0.300	<0.001
		Parental support → Hostility (T3)	-0.236	-0.294 to -0.178	<0.001	-0.360	-0.412 to -0.309	<0.001
		Parental support → VW (T1)	-0.106	-0.171 to -0.042	0.001	-0.137	-0.203 to -0.072	<0.001

Hostility			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Parental support → VW (T2)	-0.114	-0.189 to -0.038	0.003	-0.087	-0.152 to -0.022	0.009
		Parental support → VW (T3)	-0.108	-0.177 to -0.039	0.002	-0.115	-0.179 to -0.051	<0.001
		Two-parent household → Hostility (T1)	-0.082	-0.137 to -0.028	0.003	-0.015	-0.071 to 0.040	0.591
		Two-parent household → Hostility (T2)	-0.072	-0.125 to -0.019	0.008	-0.020	-0.074 to 0.033	0.458
		Two-parent household → Hostility (T3)	-0.092	-0.146 to -0.039	<0.001	-0.020	-0.074 to 0.034	0.472
		Two-parent household → VW (T1)	-0.077	-0.135 to -0.019	0.009	-0.080	-0.140 to -0.021	0.008
		Two-parent household → VW (T2)	-0.059	-0.122 to 0.003	0.061	-0.050	-0.113 to 0.014	0.123
		Two-parent household → VW (T3)	-0.011	-0.071 to 0.049	0.726	-0.045	-0.107 to 0.017	0.154

Table S13: Conduct problem Random Intercept Cross Lagged Panel Models (RI-CLPM) standardised model estimates from models favoured by the AIC weights procedure. Also presented are 95% Confidence intervals (CI) and p values. Results are presented sequentially for models testing the relationships between depressive symptom outcomes and daily hours spent video gaming, on social media and video watching. Values in bold indicate significant interactions exceeding the Bonferroni corrected significance threshold. Separate models were run for males and females and results are presented separately.

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Video gaming (VG)	Autoregressive paths	Conduct problems (T1) → Conduct problems (T2)	0.737	0.627 to 0.848	<0.001	0.452	0.315 to 0.589	<0.001
		Conduct problems (T2) → Conduct problems (T3)	0.733	0.629 to 0.838	<0.001	0.603	0.505 to 0.700	<0.001
		VG (T1) → VG (T2)	0.143	0.018 to 0.269	0.025	0.163	-0.137 to 0.463	0.286
		VG (T2) → VG (T3)	-0.212	-0.439 to 0.015	0.067	0.050	-0.515 to 0.615	0.863
	Cross-lagged paths	Conduct problems (T1) → VG (T2)	0.065	-0.095 to 0.226	0.425			
		Conduct problems (T2) → VG (T3)	0.144	-0.066 to 0.355	0.179			
		Conduct problems → VG (time invariant)				0.058	-0.079 to 0.195	0.407
		VG (T1) → Conduct problems (T2)				-0.046	-0.122 to 0.029	0.225
		VG (T2) → Conduct problems (T3)				0.035	-0.068 to 0.138	0.507
	Random Intercept correlation	Conduct problems RI ↔ VG RI	0.021	-0.691 to 0.734	0.953	0.185	0.070 to 0.301	0.002

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Contemporaneous correlations	Conduct problems ↔ VG (T1)	0.047	-0.077 to 0.171	0.455	-0.005	-0.128 to 0.118	0.938
		Conduct problems ↔ VG (T2)	0.139	-0.010 to 0.288	0.068	0.096	-0.015 to 0.208	0.091
		Conduct problems ↔ VG (T3)	0.140	-0.011 to 0.291	0.069	0.107	-0.018 to 0.232	0.093
	Regression with controls	Language → Conduct problems (T1)	0.038	-0.012 to 0.088	0.141	0.074	0.016 to 0.132	0.013
		Language → Conduct problems (T2)	0.035	-0.013 to 0.083	0.155	0.074	0.020 to 0.129	0.008
		Language → Conduct problems (T3)	0.036	-0.015 to 0.087	0.164	0.081	0.026 to 0.136	0.004
		Language → VG (T1)	0.144	0.093 to 0.194	<0.001	0.082	0.026 to 0.138	0.004
		Language → VG (T2)	0.108	0.047 to 0.169	<0.001	0.078	0.015 to 0.141	0.015
		Language → VG (T3)	0.084	0.026 to 0.143	0.005	0.072	0.008 to 0.137	0.027
		Parental support → Conduct problems (T1)	-0.248	-0.304 to -0.192	<0.001	-0.291	-0.351 to -0.231	<0.001
		Parental support → Conduct problems (T2)	-0.232	-0.290 to -0.175	<0.001	-0.316	-0.375 to -0.257	<0.001
		Parental support → Conduct problems (T3)	-0.230	-0.290 to -0.170	<0.001	-0.315	-0.375 to -0.254	<0.001

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Parental support → VG (T1)	-0.150	-0.217 to -0.084	<0.001	-0.127	-0.194 to -0.060	<0.001
		Parental support → VG (T2)	-0.185	-0.257 to -0.113	<0.001	-0.130	-0.194 to -0.065	<0.001
		Parental support → VG (T3)	-0.184	-0.253 to -0.114	<0.001	-0.155	-0.235 to -0.074	<0.001
		Two-parent household → Conduct problems (T1)	-0.085	-0.141 to -0.030	0.003	-0.052	-0.110 to 0.005	0.075
		Two-parent household → Conduct problems (T2)	-0.069	-0.123 to -0.015	0.013	-0.067	-0.123 to -0.012	0.018
		Two-parent household → Conduct problems (T3)	-0.082	-0.137 to -0.027	0.003	-0.086	-0.143 to -0.028	0.003
		Two-parent household → VG (T1)	-0.084	-0.139 to -0.029	0.003	-0.027	-0.089 to 0.036	0.404
		Two-parent household → VG (T2)	-0.066	-0.130 to -0.003	0.041	-0.002	-0.066 to 0.063	0.959
		Two-parent household → VG (T3)	-0.064	-0.124 to -0.004	0.036	-0.028	-0.096 to 0.040	0.418
Social media use (SMU)	Autoregressive paths	Conduct problems (T1) → Conduct problems (T2)				0.471	0.340 to 0.601	<0.001
		Conduct problems (T2) → Conduct problems (T3)				0.625	0.533 to 0.717	<0.001
		SMU (T1) → SMU (T2)				0.208	0.041 to 0.375	0.015

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		SMU (T2) → SMU (T3)				0.468	0.375 to 0.560	<0.001
		Social media → SMU (time invariant)	0.238	0.127 to 0.348	<0.001			
	Cross-lagged paths	Conduct problems → SMU (time invariant)	0.068	-0.046 to 0.181	0.242	0.100	0.019 to 0.182	0.016
		SMU (T1) → Conduct problems (T2)				0.031	-0.066 to 0.128	0.536
		SMU (T2) → Conduct problems (T3)				0.006	-0.059 to 0.071	0.858
	Random Intercept correlation	Conduct problems RI ↔ SMU RI	0.849	-0.950 to 2.647	0.355	0.351	0.165 to 0.538	<0.001
	Contemporaneous correlations	Conduct problems ↔ SMU (T1)	0.091	-0.107 to 0.290	0.367	0.168	0.020 to 0.316	0.027
		Conduct problems ↔ SMU (T2)	0.170	0.070 to 0.270	<0.001	0.182	0.110 to 0.253	<0.001
		Conduct problems ↔ SMU (T3)	0.173	0.071 to 0.275	<0.001	0.229	0.137 to 0.321	<0.001
	Regression with controls	Language → Conduct problems (T1)	0.042	-0.008 to 0.093	0.097	0.078	0.020 to 0.137	0.008
		Language → Conduct problems (T2)	0.040	-0.009 to 0.089	0.108	0.078	0.023 to 0.132	0.005
		Language → Conduct problems (T3)	0.041	-0.010 to 0.091	0.116	0.085	0.030 to 0.139	0.002

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → SMU (T1)	-0.019	-0.079 to 0.042	0.548	-0.039	-0.097 to 0.018	0.180
		Language → SMU (T2)	0.033	-0.023 to 0.088	0.247	0.060	0.005 to 0.115	0.033
		Language → SMU (T3)	0.076	0.023 to 0.129	0.005	0.102	0.049 to 0.155	<0.001
		Parental support → Conduct problems (T1)	-0.247	-0.303 to -0.191	<0.001	-0.291	-0.351 to -0.231	<0.001
		Parental support → Conduct problems (T2)	-0.235	-0.293 to -0.177	<0.001	-0.315	-0.374 to -0.256	<0.001
		Parental support → Conduct problems (T3)	-0.229	-0.288 to -0.169	<0.001	-0.315	-0.375 to -0.255	<0.001
		Parental support → SMU (T1)	-0.047	-0.111 to 0.016	0.144	-0.146	-0.213 to -0.080	<0.001
		Parental support → SMU (T2)	-0.014	-0.088 to 0.061	0.720	-0.073	-0.141 to -0.006	0.032
		Parental support → SMU (T3)	-0.011	-0.084 to 0.063	0.777	-0.119	-0.185 to -0.053	<0.001
		Two-parent household → Conduct problems (T1)	-0.082	-0.138 to -0.027	0.004	-0.050	-0.108 to 0.007	0.086
		Two-parent household → Conduct problems (T2)	-0.067	-0.121 to -0.012	0.017	-0.065	-0.121 to -0.010	0.021
		Two-parent household → Conduct problems (T3)	-0.079	-0.133 to -0.024	0.005	-0.084	-0.141 to -0.026	0.004

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Video watching (VW)		Two-parent household → SMU (T1)	-0.081	-0.141 to -0.021	0.008	-0.127	-0.189 to -0.065	<0.001
		Two-parent household → SMU (T2)	-0.002	-0.065 to 0.062	0.955	-0.080	-0.142 to -0.018	0.011
		Two-parent household → SMU (T3)	-0.025	-0.086 to 0.036	0.424	-0.050	-0.111 to 0.012	0.115
	Autoregressive paths	Conduct problems (T1) → Conduct problems (T2)	0.745	0.635 to 0.854	<0.001	0.468	0.335 to 0.600	<0.001
		Conduct problems (T2) → Conduct problems (T3)	0.737	0.632 to 0.843	<0.001	0.620	0.528 to 0.712	<0.001
		VW (T1) → VW (T2)	0.213	0.082 to 0.345	0.001	0.102	-0.073 to 0.278	0.253
		VW (T2) → VW (T3)	0.097	-0.024 to 0.219	0.117	0.253	0.126 to 0.380	<0.001
	Cross-lagged paths	Conduct problems (T1) → VW (T2)	-0.035	-0.174 to 0.105	0.626			
		Conduct problems (T2) → VW (T3)	0.059	-0.084 to 0.203	0.417			
		Conduct problems → VW (time invariant)				0.018	-0.075 to 0.111	0.705
		VW (T1) → Conduct problems (T2)				-0.101	-0.199 to -0.003	0.043
		VW (T2) → Conduct problems (T3)				-0.041	-0.108 to 0.026	0.227

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Random Intercept correlation	Conduct problems RI ↔ VW RI	0.551	-3.068 to 4.169	0.765	0.293	0.159 to 0.427	<0.001
	Contemporaneous correlations	Conduct problems ↔ VW (T1)	0.041	-0.143 to 0.225	0.663	0.018	-0.146 to 0.181	0.833
		Conduct problems ↔ VW (T2)	0.019	-0.088 to 0.126	0.729	0.126	0.058 to 0.194	<0.001
		Conduct problems ↔ VW (T3)	0.018	-0.086 to 0.123	0.730	0.145	0.066 to 0.224	<0.001
	Regression with controls	Language → Conduct problems (T1)	0.036	-0.014 to 0.086	0.157	0.077	0.019 to 0.134	0.009
		Language → Conduct problems (T2)	0.033	-0.015 to 0.082	0.175	0.076	0.022 to 0.131	0.006
		Language → Conduct problems (T3)	0.034	-0.016 to 0.085	0.183	0.083	0.028 to 0.138	0.003
		Language → VW (T1)	0.029	-0.027 to 0.085	0.306	0.012	-0.052 to 0.075	0.719
		Language → VW (T2)	0.113	0.058 to 0.167	<0.001	0.103	0.048 to 0.159	<0.001
		Language → VW (T3)	0.090	0.037 to 0.143	<0.001	0.127	0.071 to 0.183	<0.001
		Parental support → Conduct problems (T1)	-0.248	-0.304 to -0.192	<0.001	-0.291	-0.351 to -0.231	<0.001
		Parental support → Conduct problems (T2)	-0.233	-0.290 to -0.175	<0.001	-0.315	-0.375 to -0.256	<0.001

Conduct problems			Male			Female		
Screen type	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Parental support → Conduct problems (T3)	-0.230	-0.290 to -0.170	<0.001	-0.315	-0.375 to -0.254	<0.001
		Parental support → VW (T1)	-0.107	-0.172 to -0.043	0.001	-0.137	-0.202 to -0.071	<0.001
		Parental support → VW (T2)	-0.115	-0.191 to -0.039	0.003	-0.086	-0.151 to -0.021	0.010
		Parental support → VW (T3)	-0.107	-0.177 to -0.038	0.002	-0.116	-0.179 to -0.052	<0.001
		Two-parent household → Conduct problems (T1)	-0.086	-0.142 to -0.031	0.002	-0.051	-0.109 to 0.006	0.081
		Two-parent household → Conduct problems (T2)	-0.070	-0.124 to -0.016	0.011	-0.066	-0.122 to -0.011	0.020
		Two-parent household → Conduct problems (T3)	-0.083	-0.138 to -0.028	0.003	-0.085	-0.142 to -0.027	0.004
		Two-parent household → VW (T1)	-0.077	-0.135 to -0.019	0.009	-0.081	-0.141 to -0.021	0.008
		Two-parent household → VW (T2)	-0.060	-0.122 to 0.003	0.062	-0.050	-0.114 to 0.014	0.123
		Two-parent household → VW (T3)	-0.009	-0.069 to 0.051	0.765	-0.043	-0.104 to 0.018	0.171

Table S14 Standardised model estimates from the Cross-lagged panel model (CLPM) testing the associations between social media use (SMU) activities (active and passive use) and depressive symptoms, hostility and conduct problems *with results presented separately for males and females*.

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Depressive symptoms	Autoregressive paths	Active SMU	0.812	0.766 to 0.857	<0.001	0.832	0.798 to 0.867	<0.001
		Passive SMU	0.496	0.428 to 0.565	<0.001	0.503	0.445 to 0.560	<0.001
		Depressive symptoms	0.685	0.648 to 0.722	<0.001	0.721	0.687 to 0.755	<0.001
	Cross-lagged paths	Active SMU → Depressive symptoms	-0.052	-0.103 to -0.000	0.048	0.064	0.018 to 0.110	0.007
		Passive SMU → Depressive symptoms	0.065	0.012 to 0.118	0.016	-0.018	-0.062 to 0.027	0.442
		Depressive symptoms → Active SMU	0.013	-0.030 to 0.056	0.539	0.015	-0.024 to 0.055	0.452
		Depressive symptoms → Passive SMU	0.059	0.002 to 0.115	0.043	0.050	0.000 to 0.100	0.050
		Passive SMU → Active SMU	-0.047	-0.103 to 0.009	0.097	-0.056	-0.099 to -0.013	0.010
		Active SMU → Passive SMU	0.147	0.080 to 0.214	<0.001	0.170	0.110 to 0.230	<0.001
	Contemporaneous correlations	Active SMU ↔ Passive SMU (T1)	0.691	0.657 to 0.725	<0.001	0.605	0.565 to 0.646	<0.001
		Active SMU ↔ Depressive symptoms (T1)	0.045	-0.017 to 0.108	0.154	0.116	0.054 to 0.179	<0.001

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Passive SMU ↔ Depressive symptoms (T1)	0.119	0.057 to 0.181	<0.001	0.131	0.070 to 0.192	<0.001
		Active SMU ↔ Passive SMU (T2)	0.564	0.518 to 0.611	<0.001	0.496	0.445 to 0.548	<0.001
		Active SMU ↔ Depressive symptoms (T2)	0.109	0.043 to 0.174	0.001	0.055	-0.005 to 0.116	0.074
		Passive SMU ↔ Depressive symptoms (T2)	0.108	0.039 to 0.177	0.002	0.064	0.002 to 0.126	0.043
	Regression with controls	Two-parent household → Active SMU (T1)	-0.059	-0.110 to -0.007	0.026	0.007	-0.048 to 0.063	0.802
		Parental support → Active SMU (T1)	0.123	0.063 to 0.183	<0.001	0.050	-0.012 to 0.112	0.114
		Language → Active SMU (T1)	-0.059	-0.090 to -0.029	<0.001	0.068	0.041 to 0.096	<0.001
		Two-parent household → Active SMU (T2)	0.012	-0.020 to 0.045	0.452	0.007	-0.024 to 0.038	0.648
		Parental support → Active SMU (T2)	0.024	-0.022 to 0.070	0.304	0.013	-0.029 to 0.054	0.550
		Language → Active SMU (T2)	-0.030	-0.049 to -0.011	0.002	0.014	-0.001 to 0.028	0.073
		Two-parent household → Passive SMU (T1)	0.004	-0.044 to 0.053	0.859	-0.017	-0.072 to 0.038	0.538
		Parental support → Passive SMU (T1)	0.081	0.020 to 0.142	0.009	-0.001	-0.062 to 0.060	0.978

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → Passive SMU (T1)	-0.010	-0.038 to 0.019	0.508	0.073	0.047 to 0.100	<0.001
		Two-parent household → Passive SMU (T2)	-0.007	-0.049 to 0.036	0.761	0.012	-0.029 to 0.052	0.577
		Parental support → Passive SMU (T2)	-0.007	-0.066 to 0.052	0.825	0.008	-0.047 to 0.063	0.768
		Language → Passive SMU (T2)	-0.001	-0.026 to 0.024	0.937	0.012	-0.007 to 0.032	0.218
		Two-parent household → Depressive symptoms (T1)	-0.106	-0.152 to -0.059	<0.001	-0.028	-0.076 to 0.020	0.258
		Parental support → Depressive symptoms (T1)	-0.333	-0.388 to -0.278	<0.001	-0.395	-0.443 to -0.346	<0.001
		Language → Depressive symptoms (T1)	0.017	-0.009 to 0.043	0.196	0.085	0.062 to 0.109	<0.001
		Two-parent household → Depressive symptoms (T2)	-0.072	-0.106 to -0.038	<0.001	-0.007	-0.039 to 0.026	0.681
		Parental support → Depressive symptoms (T2)	-0.157	-0.203 to -0.111	<0.001	-0.117	-0.161 to -0.072	<0.001
		Language → Depressive symptoms (T2)	-0.008	-0.028 to 0.011	0.403	0.035	0.019 to 0.051	<0.001
Hostility	Autoregressive paths	Active SMU	0.809	0.763 to 0.854	<0.001	0.830	0.795 to 0.864	<0.001
		Passive SMU	0.496	0.429 to 0.564	<0.001	0.505	0.448 to 0.563	<0.001

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Hostility	0.745	0.715 to 0.774	<0.001	0.765	0.733 to 0.796	<0.001
	Cross-lagged paths	Active SMU → Hostility	0.007	-0.045 to 0.058	0.801	0.072	0.029 to 0.116	0.001
		Passive SMU → Hostility	0.024	-0.028 to 0.075	0.369	-0.028	-0.073 to 0.017	0.228
		Hostility → Active SMU	0.052	0.017 to 0.088	0.004	0.028	-0.013 to 0.069	0.184
		Hostility → Passive SMU	0.066	0.019 to 0.114	0.006	0.030	-0.022 to 0.082	0.259
		Passive SMU → Active SMU	-0.052	-0.107 to 0.003	0.065	-0.057	-0.100 to - 0.014	0.009
		Active SMU → Passive SMU	0.140	0.073 to 0.207	<0.001	0.169	0.109 to 0.229	<0.001
	Contemporaneous correlations	Active SMU ↔ Passive SMU (T1)	0.691	0.657 to 0.725	<0.001	0.605	0.565 to 0.646	<0.001
		Active SMU ↔ Hostility (T1)	0.138	0.078 to 0.197	<0.001	0.174	0.116 to 0.233	<0.001
		Passive SMU ↔ Hostility (T1)	0.167	0.108 to 0.227	<0.001	0.154	0.093 to 0.214	<0.001
		Active SMU ↔ Passive SMU (T2)	0.561	0.515 to 0.608	<0.001	0.496	0.444 to 0.547	<0.001
		Active SMU ↔ Hostility (T2)	0.138	0.069 to 0.207	<0.001	0.127	0.068 to 0.186	<0.001

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Passive SMU ↔ Hostility (T2)	0.137	0.068 to 0.205	<0.001	0.153	0.094 to 0.212	<0.001
	Regression with controls	Two-parent household → Active SMU (T1)	-0.058	-0.109 to -0.006	0.027	0.007	-0.048 to 0.063	0.797
		Parental support → Active SMU (T1)	0.122	0.062 to 0.183	<0.001	0.049	-0.013 to 0.111	0.122
		Language → Active SMU (T1)	-0.059	-0.089 to -0.029	<0.001	0.069	0.041 to 0.097	<0.001
		Two-parent household → Active SMU (T2)	0.014	-0.018 to 0.046	0.397	0.008	-0.023 to 0.039	0.625
		Parental support → Active SMU (T2)	0.032	-0.012 to 0.076	0.153	0.017	-0.024 to 0.058	0.420
		Language → Active SMU (T2)	-0.034	-0.054 to -0.015	<0.001	0.014	-0.000 to 0.029	0.053
		Two-parent household → Passive SMU (T1)	0.006	-0.043 to 0.054	0.823	-0.017	-0.072 to 0.038	0.544
		Parental support → Passive SMU (T1)	0.079	0.018 to 0.139	0.011	-0.002	-0.063 to 0.059	0.943
		Language → Passive SMU (T1)	-0.010	-0.038 to 0.018	0.497	0.074	0.047 to 0.100	<0.001
		Two-parent household → Passive SMU (T2)	-0.009	-0.051 to 0.033	0.672	0.011	-0.029 to 0.052	0.586
		Parental support → Passive SMU (T2)	-0.012	-0.068 to 0.045	0.688	-0.001	-0.056 to 0.054	0.981

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → Passive SMU (T2)	-0.006	-0.031 to 0.019	0.659	0.016	-0.004 to 0.035	0.109
		Two-parent household → Hostility (T1)	-0.051	-0.099 to -0.002	0.040	-0.035	-0.085 to 0.016	0.182
		Parental support → Hostility (T1)	-0.231	-0.287 to -0.176	<0.001	-0.356	-0.407 to -0.305	<0.001
		Language → Hostility (T1)	0.074	0.048 to 0.101	<0.001	0.023	-0.002 to 0.048	0.071
		Two-parent household → Hostility (T2)	-0.033	-0.066 to -0.000	0.050	-0.009	-0.039 to 0.022	0.572
		Parental support → Hostility (T2)	-0.064	-0.105 to -0.023	0.002	-0.093	-0.134 to -0.052	<0.001
		Language → Hostility (T2)	0.006	-0.013 to 0.025	0.506	0.020	0.006 to 0.034	0.006
Conduct problems	Autoregressive paths	Active SMU	0.796	0.750 to 0.843	<0.001	0.822	0.787 to 0.857	<0.001
		Passive SMU	0.495	0.427 to 0.562	<0.001	0.498	0.440 to 0.556	<0.001
		Conduct problems	0.740	0.708 to 0.771	<0.001	0.832	0.804 to 0.861	<0.001
	Cross-lagged paths	Active SMU → Conduct problems	0.032	-0.021 to 0.084	0.238	0.030	-0.006 to 0.066	0.103
		Passive SMU → Conduct problems	-0.010	-0.064 to 0.044	0.718	-0.024	-0.062 to 0.014	0.216

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Conduct problems → Active SMU	0.083	0.042 to 0.123	<0.001	0.076	0.039 to 0.114	<0.001
		Conduct problems → Passive SMU	0.100	0.049 to 0.150	<0.001	0.085	0.034 to 0.135	0.001
		Passive SMU → Active SMU	-0.054	-0.109 to 0.001	0.055	-0.063	-0.106 to -0.020	0.004
		Active SMU → Passive SMU	0.126	0.058 to 0.193	<0.001	0.160	0.100 to 0.221	<0.001
	Contemporaneous correlations	Active SMU ↔ Passive SMU (T1)	0.691	0.657 to 0.724	<0.001	0.605	0.565 to 0.646	<0.001
		Active SMU ↔ Conduct problems (T1)	0.253	0.196 to 0.309	<0.001	0.222	0.161 to 0.283	<0.001
		Passive SMU ↔ Conduct problems (T1)	0.233	0.173 to 0.292	<0.001	0.206	0.146 to 0.265	<0.001
		Active SMU ↔ Passive SMU (T2)	0.558	0.511 to 0.605	<0.001	0.491	0.439 to 0.543	<0.001
		Active SMU ↔ Conduct problems (T2)	0.121	0.050 to 0.191	<0.001	0.088	0.029 to 0.146	0.003
		Passive SMU ↔ Conduct problems (T2)	0.092	0.017 to 0.166	0.016	0.090	0.026 to 0.153	0.006
	Regression with controls	Two-parent household → Active SMU (T1)	-0.056	-0.108 to -0.005	0.031	0.007	-0.049 to 0.062	0.816
		Parental support → Active SMU (T1)	0.122	0.062 to 0.182	<0.001	0.049	-0.013 to 0.111	0.121

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → Active SMU (T1)	-0.060	-0.090 to - 0.029	<0.001	0.069	0.042 to 0.097	<0.001
		Two-parent household → Active SMU (T2)	0.014	-0.017 to 0.046	0.376	0.012	-0.019 to 0.042	0.457
		Parental support → Active SMU (T2)	0.041	-0.003 to 0.086	0.066	0.031	-0.010 to 0.072	0.139
		Language → Active SMU (T2)	-0.036	-0.055 to - 0.017	<0.001	0.010	-0.004 to 0.025	0.162
		Two-parent household → Passive SMU (T1)	0.007	-0.042 to 0.055	0.778	-0.018	-0.073 to 0.037	0.525
		Parental support → Passive SMU (T1)	0.078	0.017 to 0.139	0.012	-0.002	-0.063 to 0.059	0.956
		Language → Passive SMU (T1)	-0.011	-0.039 to 0.018	0.464	0.074	0.048 to 0.101	<0.001
		Two-parent household → Passive SMU (T2)	-0.008	-0.050 to 0.033	0.694	0.016	-0.025 to 0.056	0.445
		Parental support → Passive SMU (T2)	-0.001	-0.057 to 0.054	0.965	0.015	-0.039 to 0.069	0.579
		Language → Passive SMU (T2)	-0.007	-0.033 to 0.018	0.565	0.011	-0.008 to 0.031	0.252
		Two-parent household → Conduct problems (T1)	-0.054	-0.102 to - 0.006	0.027	-0.065	-0.117 to - 0.014	0.013
		Parental support → Conduct problems (T1)	-0.231	-0.289 to - 0.173	<0.001	-0.316	-0.375 to - 0.256	<0.001

Active-passive SMU CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Language → Conduct problems (T1)	0.061	0.034 to 0.087	<0.001	0.078	0.053 to 0.103	<0.001
		Two-parent household → Conduct problems (T2)	-0.025	-0.060 to 0.010	0.156	-0.030	-0.059 to - 0.001	0.043
		Parental support → Conduct problems (T2)	-0.060	-0.106 to - 0.015	0.009	-0.053	-0.094 to - 0.012	0.011
		Language → Conduct problems (T2)	0.019	-0.002 to 0.040	0.083	0.019	0.006 to 0.033	0.006

Table S15: Standardised model estimates from the Cross-lagged panel model (CLPM) testing the associations between time spent (daily hours) on different video gaming activities (online and offline use) and depressive symptoms, hostility and conduct problems *with results presented separately for males and females*.

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Depressive symptoms	Autoregressive paths	Online VG	0.383	0.312 to 0.454	<0.001	0.539	0.400 to 0.679	<0.001
		Offline VG	0.345	0.255 to 0.435	<0.001	0.307	0.149 to 0.465	<0.001
		Depressive symptoms	0.690	0.654 to 0.726	<0.001	0.721	0.688 to 0.755	<0.001

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Cross-lagged paths	Online VG → Depressive symptoms	-0.026	-0.071 to 0.018	0.247	0.039	0.002 to 0.077	0.039
		Offline VG → Depressive symptoms	0.016	-0.027 to 0.059	0.466	-0.004	-0.040 to 0.032	0.842
		Depressive symptoms → Online VG	0.091	0.023 to 0.158	0.008	0.099	0.037 to 0.161	0.002
		Depressive symptoms → Offline VG	0.036	-0.025 to 0.098	0.249	0.040	-0.025 to 0.105	0.232
		Offline VG → Online VG	0.016	-0.062 to 0.094	0.684	0.044	-0.064 to 0.152	0.427
		Online VG → Offline VG	0.040	-0.037 to 0.117	0.306	0.326	0.158 to 0.494	<0.001
	Contemporaneous correlations	Online VG ↔ Offline VG (T1)	0.137	0.050 to 0.225	0.002	0.466	0.321 to 0.611	<0.001
		Online VG ↔ Depressive symptoms (T1)	0.048	-0.015 to 0.112	0.138	0.131	0.064 to 0.197	<0.001
		Offline VG ↔ Depressive symptoms (T1)	0.120	0.058 to 0.183	<0.001	0.130	0.066 to 0.195	<0.001
		Online VG ↔ Offline VG (T2)	0.143	0.051 to 0.235	0.002	0.393	0.250 to 0.537	<0.001
		Online VG ↔ Depressive symptoms (T2)	0.104	0.038 to 0.170	0.002	0.054	-0.003 to 0.111	0.062
		Offline VG ↔ Depressive symptoms (T2)	0.094	0.022 to 0.167	0.011	0.057	0.002 to 0.112	0.043

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Regression with controls	Two-parent household → Online VG (T1)	-0.082	-0.141 to -0.023	0.007	-0.036	-0.097 to 0.025	0.251
		Parental support → Online VG (T1)	-0.144	-0.216 to -0.073	<0.001	-0.127	-0.199 to -0.055	<0.001
		Language → Online VG (T1)	0.046	0.010 to 0.083	0.014	0.024	-0.007 to 0.055	0.128
		Two-parent household → Online VG (T2)	-0.059	-0.114 to -0.005	0.033	-0.043	-0.101 to 0.014	0.138
		Parental support → Online VG (T2)	-0.051	-0.125 to 0.022	0.171	-0.015	-0.082 to 0.053	0.672
		Language → Online VG (T2)	0.035	0.002 to 0.068	0.035	0.009	-0.022 to 0.040	0.581
		Two-parent household → Offline VG (T1)	-0.053	-0.113 to 0.006	0.079	-0.019	-0.076 to 0.039	0.524
		Parental support → Offline VG (T1)	-0.122	-0.199 to -0.044	0.002	-0.099	-0.158 to -0.039	0.001
		Language → Offline VG (T1)	0.043	0.006 to 0.079	0.021	0.013	-0.016 to 0.041	0.381
		Two-parent household → Offline VG (T2)	-0.004	-0.061 to 0.053	0.883	0.000	-0.055 to 0.055	0.997
		Parental support → Offline VG (T2)	-0.080	-0.150 to -0.010	0.026	-0.052	-0.130 to 0.026	0.193
		Language → Offline VG (T2)	0.006	-0.028 to 0.039	0.748	-0.003	-0.030 to 0.025	0.854

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Two-parent household → Depressive symptoms (T1)	-0.106	-0.152 to -0.059	<0.001	-0.028	-0.076 to 0.020	0.258
		Parental support → Depressive symptoms (T1)	-0.333	-0.388 to -0.278	<0.001	-0.395	-0.443 to -0.346	<0.001
		Language → Depressive symptoms (T1)	0.017	-0.009 to 0.043	0.197	0.085	0.062 to 0.109	<0.001
		Two-parent household → Depressive symptoms (T2)	-0.069	-0.103 to -0.035	<0.001	-0.005	-0.037 to 0.028	0.775
		Parental support → Depressive symptoms (T2)	-0.158	-0.203 to -0.113	<0.001	-0.109	-0.154 to -0.063	<0.001
		Language → Depressive symptoms (T2)	-0.005	-0.025 to 0.014	0.587	0.037	0.021 to 0.052	<0.001
Hostility	Autoregressive paths	Online VG	0.380	0.308 to 0.452	<0.001	0.543	0.405 to 0.681	<0.001
		Offline VG	0.348	0.258 to 0.438	<0.001	0.311	0.153 to 0.469	<0.001
		Hostility	0.751	0.723 to 0.779	<0.001	0.773	0.742 to 0.803	<0.001
	Cross-lagged paths	Online VG → Hostility	-0.029	-0.071 to 0.014	0.191	0.041	0.002 to 0.081	0.042
		Offline VG → Hostility	0.034	-0.009 to 0.077	0.124	-0.025	-0.065 to 0.015	0.220
		Hostility → Online VG	0.064	0.003 to 0.125	0.041	0.066	0.004 to 0.129	0.037

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Hostility → Offline VG	0.002	-0.058 to 0.061	0.959	0.032	-0.028 to 0.091	0.294
		Offline VG → Online VG	0.023	-0.055 to 0.101	0.568	0.046	-0.062 to 0.155	0.400
		Online VG → Offline VG	0.045	-0.034 to 0.123	0.266	0.324	0.158 to 0.491	<0.001
	Contemporaneous correlations	Online VG ↔ Offline VG (T1)	0.140	0.052 to 0.227	0.002	0.467	0.322 to 0.612	<0.001
		Online VG ↔ Hostility (T1)	0.113	0.049 to 0.177	<0.001	0.119	0.050 to 0.188	<0.001
		Offline VG ↔ Hostility (T1)	0.053	-0.012 to 0.117	0.108	0.159	0.092 to 0.226	<0.001
		Online VG ↔ Offline VG (T2)	0.146	0.054 to 0.238	0.002	0.394	0.250 to 0.537	<0.001
		Online VG ↔ Hostility (T2)	0.107	0.042 to 0.173	0.001	0.017	-0.047 to 0.082	0.596
		Offline VG ↔ Hostility (T2)	0.100	0.037 to 0.163	0.002	0.088	0.015 to 0.160	0.018
	Regression with controls	Two-parent household → Online VG (T1)	-0.083	-0.142 to -0.024	0.006	-0.035	-0.096 to 0.026	0.255
		Parental support → Online VG (T1)	-0.142	-0.214 to -0.070	<0.001	-0.128	-0.200 to -0.056	<0.001
		Language → Online VG (T1)	0.047	0.011 to 0.084	0.011	0.024	-0.007 to 0.055	0.127

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
		Two-parent household → Online VG (T2)	-0.065	-0.119 to -0.011	0.019	-0.044	-0.102 to 0.014	0.138
		Parental support → Online VG (T2)	-0.071	-0.143 to -0.000	0.049	-0.032	-0.102 to 0.037	0.362
		Language → Online VG (T2)	0.032	-0.002 to 0.065	0.062	0.016	-0.016 to 0.047	0.323
		Two-parent household → Offline VG (T1)	-0.051	-0.111 to 0.009	0.093	-0.018	-0.075 to 0.040	0.541
		Parental support → Offline VG (T1)	-0.125	-0.203 to -0.047	0.002	-0.099	-0.158 to -0.039	0.001
		Language → Offline VG (T1)	0.041	0.005 to 0.078	0.026	0.013	-0.016 to 0.041	0.384
		Two-parent household → Offline VG (T2)	-0.007	-0.064 to 0.049	0.799	-0.000	-0.056 to 0.055	0.997
		Parental support → Offline VG (T2)	-0.091	-0.159 to -0.024	0.008	-0.057	-0.135 to 0.022	0.155
		Language → Offline VG (T2)	0.005	-0.029 to 0.039	0.760	0.000	-0.027 to 0.027	0.984
		Two-parent household → Hostility (T1)	-0.051	-0.099 to -0.002	0.040	-0.035	-0.085 to 0.016	0.182
		Parental support → Hostility (T1)	-0.231	-0.287 to -0.176	<0.001	-0.356	-0.407 to -0.305	<0.001
		Language → Hostility (T1)	0.074	0.048 to 0.101	<0.001	0.023	-0.002 to 0.048	0.071

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
Conduct problems	Autoregressive paths	Two-parent household → Hostility (T2)	-0.033	-0.066 to -0.000	0.047	-0.007	-0.037 to 0.024	0.673
		Parental support → Hostility (T2)	-0.060	-0.101 to -0.019	0.004	-0.084	-0.126 to -0.042	<0.001
		Language → Hostility (T2)	0.005	-0.014 to 0.024	0.583	0.022	0.008 to 0.036	0.002
	Cross-lagged paths	Online VG	0.378	0.305 to 0.450	<0.001	0.542	0.405 to 0.678	<0.001
		Offline VG	0.348	0.258 to 0.438	<0.001	0.309	0.151 to 0.468	<0.001
		Conduct problems	0.743	0.713 to 0.773	<0.001	0.828	0.800 to 0.857	<0.001
		Online VG → Conduct problems	0.021	-0.027 to 0.069	0.383	0.056	0.003 to 0.109	0.038
		Offline VG → Conduct problems	-0.004	-0.049 to 0.042	0.878	-0.015	-0.060 to 0.029	0.497
		Conduct problems → Online VG	0.082	0.020 to 0.144	0.010	0.068	0.001 to 0.134	0.047
		Conduct problems → Offline VG	-0.005	-0.068 to 0.057	0.871	0.010	-0.055 to 0.076	0.761
		Offline VG → Online VG	0.028	-0.049 to 0.106	0.474	0.048	-0.058 to 0.155	0.374
		Online VG → Offline VG	0.043	-0.035 to 0.122	0.280	0.329	0.163 to 0.494	<0.001

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Contemporaneous correlations	Online VG ↔ Offline VG (T1)	0.139	0.052 to 0.227	0.002	0.467	0.322 to 0.612	<0.001
		Online VG ↔ Conduct problems (T1)	0.107	0.042 to 0.172	0.001	0.125	0.048 to 0.202	0.001
		Offline VG ↔ Conduct problems (T1)	-0.001	-0.065 to 0.063	0.980	0.100	0.023 to 0.177	0.011
		Online VG ↔ Offline VG (T2)	0.147	0.056 to 0.238	0.002	0.395	0.252 to 0.538	<0.001
		Online VG ↔ Conduct problems (T2)	0.055	-0.014 to 0.124	0.121	0.012	-0.067 to 0.091	0.769
		Offline VG ↔ Conduct problems (T2)	0.089	0.012 to 0.166	0.023	0.102	0.024 to 0.180	0.011
	Regression with controls	Two-parent household → Online VG (T1)	-0.080	-0.139 to -0.021	0.008	-0.037	-0.098 to 0.023	0.228
		Parental support → Online VG (T1)	-0.147	-0.220 to -0.075	<0.001	-0.127	-0.199 to -0.054	<0.001
		Language → Online VG (T1)	0.047	0.010 to 0.084	0.013	0.025	-0.006 to 0.056	0.108
		Two-parent household → Online VG (T2)	-0.062	-0.117 to -0.008	0.024	-0.040	-0.097 to 0.017	0.172
		Parental support → Online VG (T2)	-0.067	-0.137 to 0.004	0.064	-0.035	-0.106 to 0.036	0.330
		Language → Online VG (T2)	0.030	-0.003 to 0.063	0.075	0.011	-0.020 to 0.041	0.483

Online-Offline VG CLPM			Male			Female		
Outcome	Path type	Variable	Std. estimate (β)	95% CI	P value	Std. estimate (β)	95% CI	P value
	Offline VG (T1)	Two-parent household → Offline VG (T1)	-0.051	-0.111 to 0.009	0.095	-0.017	-0.075 to 0.040	0.553
		Parental support → Offline VG (T1)	-0.124	-0.202 to -0.045	0.002	-0.100	-0.160 to -0.040	0.001
		Language → Offline VG (T1)	0.040	0.004 to 0.077	0.030	0.012	-0.016 to 0.040	0.396
		Two-parent household → Offline VG (T2)	-0.009	-0.066 to 0.048	0.751	0.001	-0.054 to 0.056	0.969
		Parental support → Offline VG (T2)	-0.092	-0.160 to -0.024	0.008	-0.064	-0.143 to 0.016	0.116
		Language → Offline VG (T2)	0.006	-0.028 to 0.041	0.709	-0.001	-0.027 to 0.025	0.951
	Depressive symptoms (T1)	Two-parent household → Depressive symptoms (T1)	-0.054	-0.102 to -0.006	0.027	-0.065	-0.117 to -0.014	0.013
		Parental support → Depressive symptoms (T1)	-0.231	-0.289 to -0.173	<0.001	-0.316	-0.375 to -0.256	<0.001
		Language → Depressive symptoms (T1)	0.061	0.034 to 0.087	<0.001	0.078	0.053 to 0.103	<0.001
		Two-parent household → Depressive symptoms (T2)	-0.025	-0.060 to 0.010	0.158	-0.028	-0.056 to 0.001	0.060
		Parental support → Depressive symptoms (T2)	-0.054	-0.099 to -0.008	0.020	-0.047	-0.088 to -0.006	0.024
		Language → Depressive symptoms (T2)	0.016	-0.005 to 0.037	0.138	0.019	0.005 to 0.032	0.008

Supplementary Figures

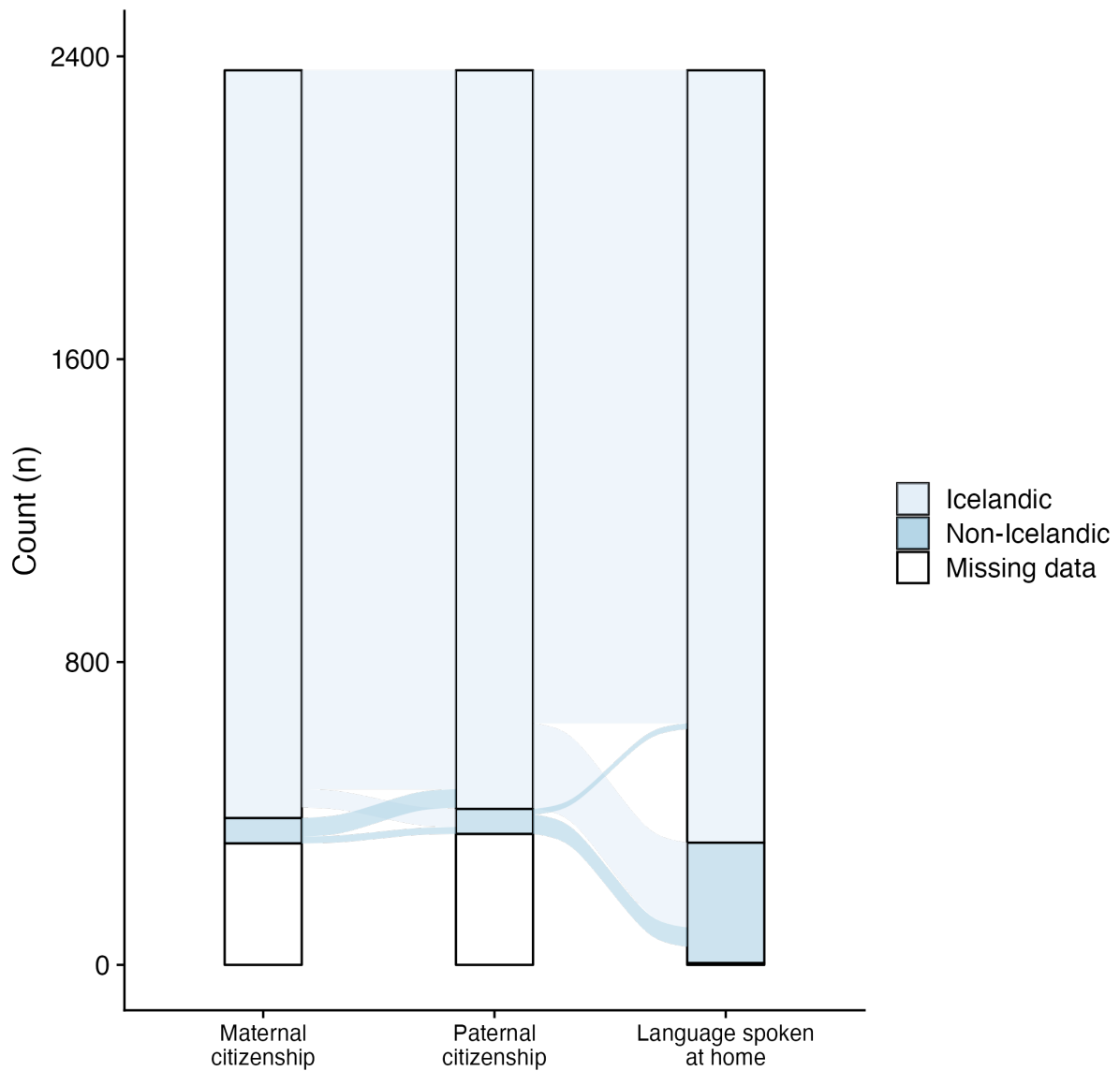


Figure S1 Stability in 'language spoken at home' survey question responses (across 2017-2019) and the reported citizenship of parents in the birth registry database within the LIFECOURSE dataset.

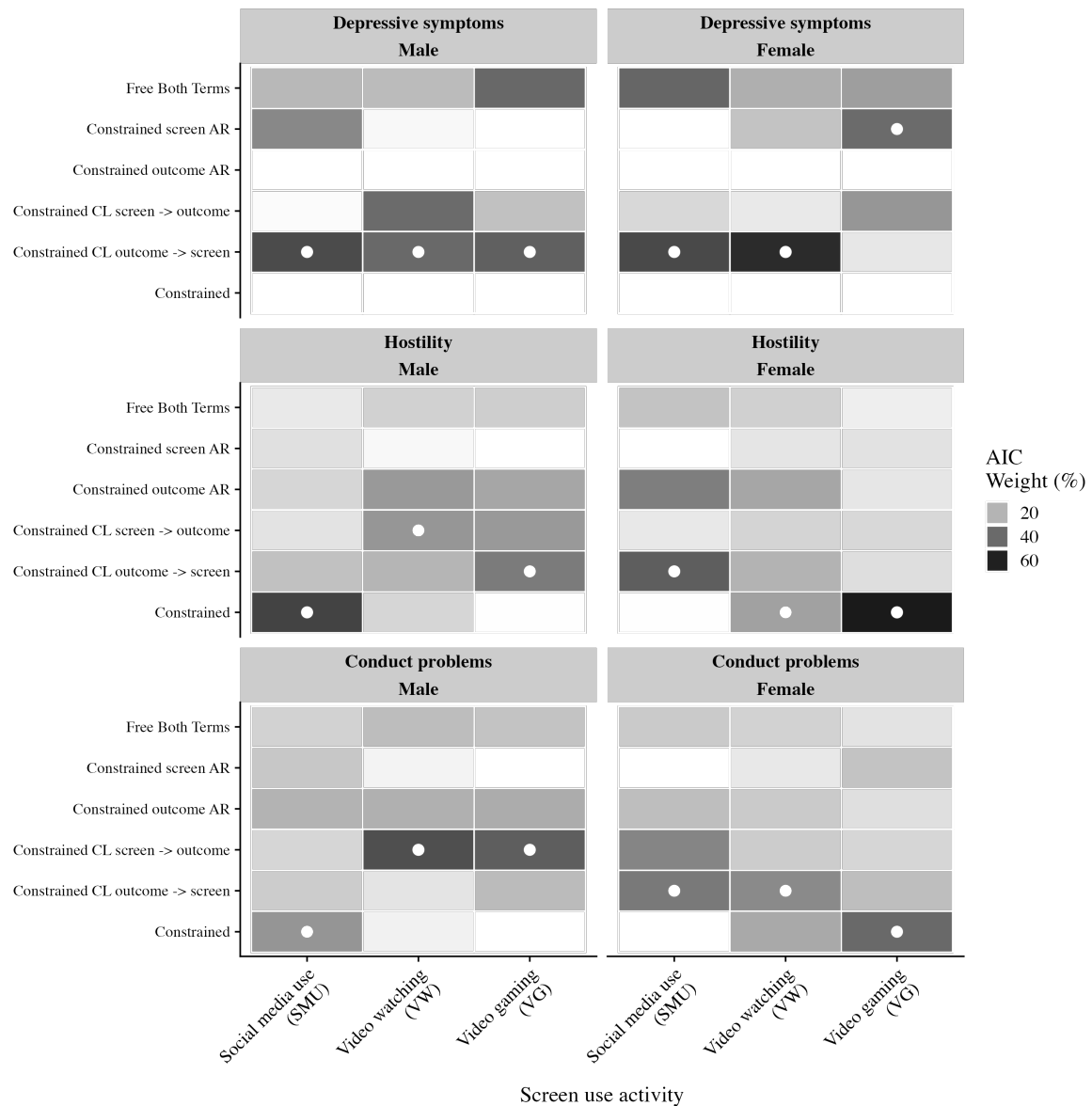


Figure S2 Akaike Information Criterion (AIC) weights for each outcome (depressive symptoms, hostility, conduct problems) and screen use activity (social media use, video watching, video gaming) combination for males (left panels) and females (right panels) separately with varying levels of model constraint detailed on y-axis. This technique evaluates the probability that the approximating model is the best (giving a % score), based on the underlying data and comparison against all other provided model structures. Darker shades indicate higher AIC weight and filled white circles indicate the model scoring highest AIC weight and therefore the best-fit model.

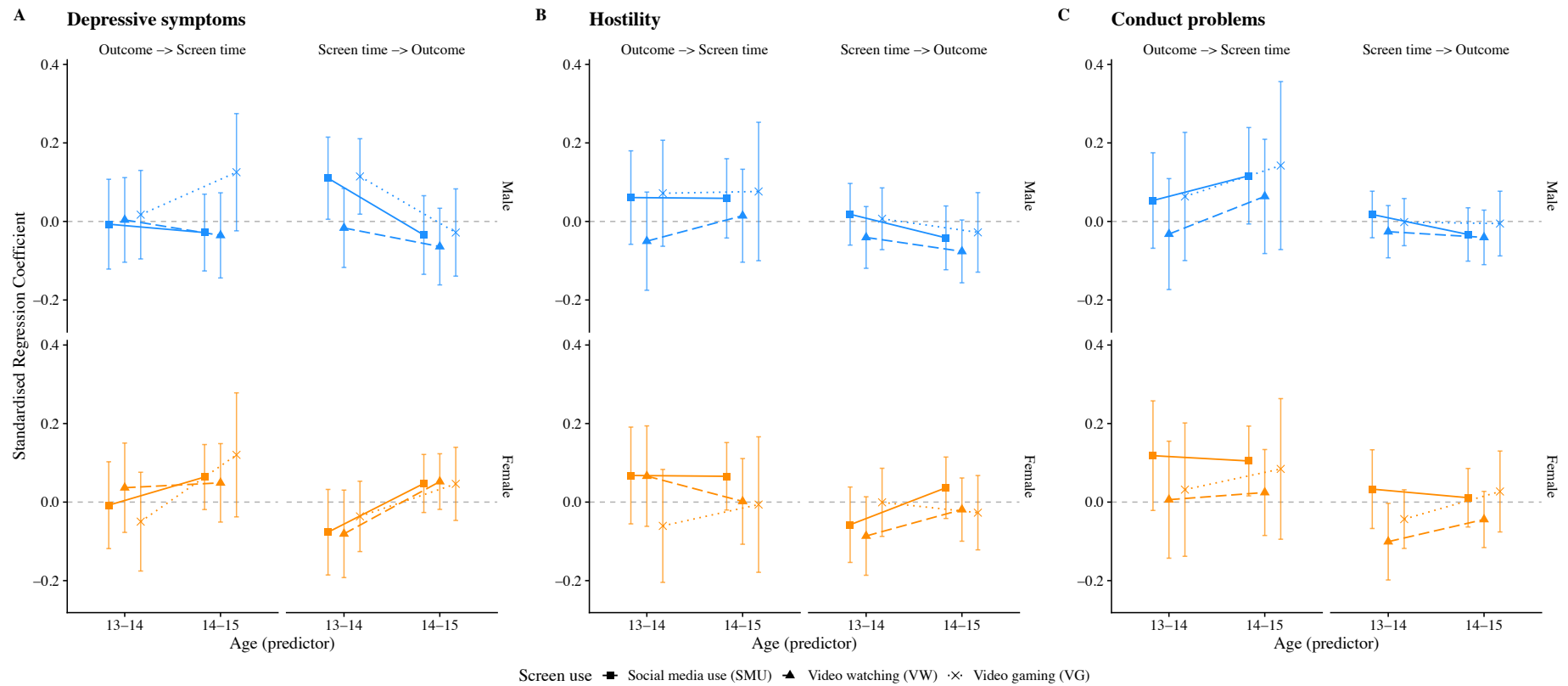


Figure S3 Cross-lagged pathway standardised model estimates from Random Intercept Cross-lagged Panel Models (RI-CLPM) from the fully-free, unconstrained models for each outcome (Plot A depressive symptoms, Plot B Hostility, and Plot C Conduct problems) and screen use activity (social media use (square symbol, solid line), watching videos (triangle symbol, dashed line), video gaming (cross symbol, dotted line)) combination for males (blue) and females (orange) separately. Error bars represent standardised 95% confidence intervals. Asterisks (*) indicates significance between $p < 0.05$ and 0.01 .

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