Trajectories of Screen Time across Adolescence and Their Associations with Adulthood Mental Health and Behavioral Outcomes?

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Screen time

- Linked to negative well-being and development?
  - Found in some studies, inconsistent and small in magnitude
  - Varied in terms of **types of screen time** and **mental health problems** (see, e.g., Tang et al., 2021, for a meta-analysis).
  - Previous research often relied on **single assessments**, while longitudinal measures can provide a more accurate understanding of screen time habits.

Screen time in adolescence

With changing **needs** in screen media during this period

- Forming identities and forming/redefining relationships with peers and parents

- Characterized by increased emotional and behavioral regulation challenges, making it crucial to manage the demands of specific media screens

- Empirical evidence: time spent on social media increases during mid to late adolescence, while traditional media use remains stable (Coyne et al., 2018)

Screen time in adolescence

- Empirical evidence suggests the need to consider variations in adolescent developmental trajectories of screen time
  - **TV**: consistently low, consistently high, and a sharp increase during the adolescent years (McVeigh et al., 2016).
  - **Texting**: perpetuals, decreasers, moderates, and increasers (Coyne et al., 2018).
  - **Online game**: low, rising, declining, and chronic groups (Hong et al., 2014).
  - **Total screen time:** always high, always moderate, and always low (Silva et al., 2017).

- Identifying young adults' outcomes differentiated by the trajectory subgroups that emerge in the longitudinal pattern analyses
  - Could help illuminate the potential distress, costs, and impairment linked to particular trajectories.
  - Outcomes: depression, anxiety (e.g., Kandola et al., 2021; Stiglic & Viner, 2019), suicidal ideation (e.g., Coyne et al., 2021), self-injury (e.g., Wiguna et al., 2021), aggression (e.g., Keikha et al., 2020), substance use (e.g., Boers et al., 2020), and delinquency (Exelmans et al., 2015)
- Theoretical frameworks
  - Displacement hypothesis: replace healthy activities or activities beneficial to youth development (e.g., cognition)
  - Exposure to specific content in media, such as violence or substance use, suicidal-/self-injury-related
  - Other factors: e.g., sleep difficulties

Current Study

- Examining media usage (TV/DVDs, videogames, and surfing/chatting on the Internet) patterns in adolescents aged 11 to 17 and their associations with outcomes at age 20.

- **Hypotheses**
  - at least **three groups** with different media usage patterns: low screen-use, increased time on chatting/surfing, moderate screen use.

  - problematic screen time trajectories would be linked to negative mental and behavioral outcomes at age 20.

Methods

Participants were from ***z-proso,*** n=1521; ages 11, 13, 15, 17, and 20

Screen time: six items, measuring the average time spent on TV/DVDs, videogames, and surfing/chatting on the Internet on a normal school day and weekend day on a 5-point Likert scale (from never to more than 3 h/day).

Outcomes at age 20

- Depression, anxiety, and aggression: Social Behavior Questionnaire (R. E. Tremblay et al., 1991).

- Suicidal ideation and self-injury: asking youth how often they had thought about suicide/intentionally self-injured during the past month

Outcomes at age 20

- Substance use (i.e., tobacco and cannabis): Have you ever taken any of them, and if yes, how many times in the last 12 months?

- Delinquency: a variety score that included responses to 7 items, e.g., stealing at home, shoplifting goods worth less than 50 CHF

Statistical Procedure

- **Trajectory**
  Parallel-process LCGAs: LMR test, AIC, BIC, SaBIC, entropy

- **Outcomes**
  BCH (Asparouhov, 2014)
  multiple comparisons: Bonferroni correction
  baseline-adjusted outcomes across trajectories were reported
  Sex as a covariate

- **Missing data**
  FIML

Results

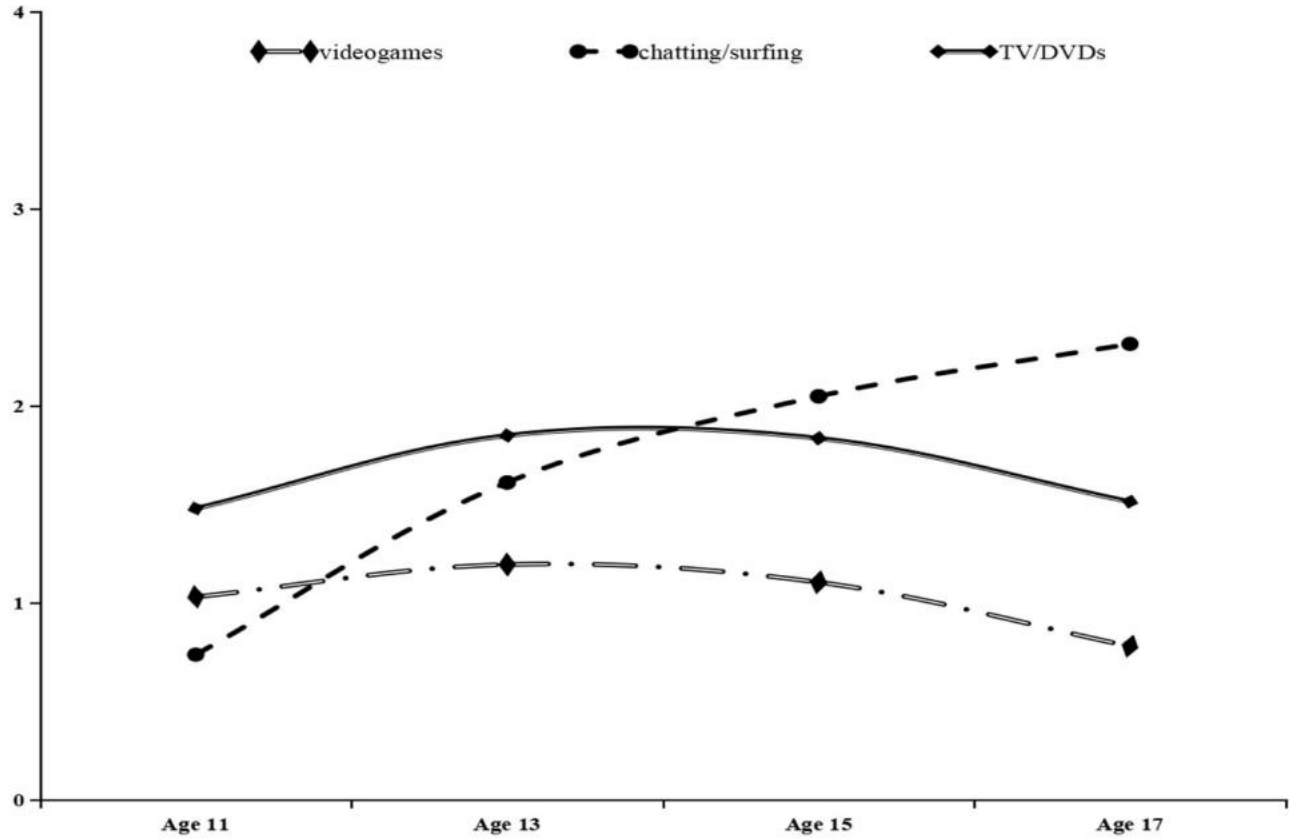


Fig. 1 Average model-based trajectories of screen time on videogames, chatting/surfing, and TV/DVDs. The values on the vertical axis represent the number of hours per day, with 4 = more than 3 h per day

Results

Table 1 Model fits for the 1–8 class models

Model	LMR	*p*	AIC	BIC	saBIC	Entropy	Model	LMR	*p*	AIC	BIC	saBIC	Entropy
Model with linear and quadratic growth							Model with linear growth						
1-class	–	–	45857.858	45969.727	45903.016	N/A	1-class	–	–	46151.143	46247.032	46189.850	N/A
2-class	1709.690	<0.001	44144.834	44309.974	44211.495	0.754	2-class	1650.249	<0.001	44482.719	44615.897	44536.479	0.753
3-class	906.847	<0.001	43245.610	43464.023	43333.776	0.812	3-class	879.468	<0.001	43600.104	43770.572	43668.916	0.811
4-class	398.278	0.103	42861.896	43133.580	42971.566	0.823	4-class	375.685	0.098	43231.094	43438.852	43314.959	0.822
5-class	**348.580**	**0.018**	**42490.699**	**42815.653**	**42621.872**	**0.786**	5-class	301.768	0.014	42899.106	43144.154	42998.024	0.784
6-class	253.835	0.583	42253.399	42631.625	42406.077	0.795	6-class	238.210	0.067	42670.252	42952.590	42784.222	0.794
7-class	226.896	0.652	42043.407	42474.904	42217.588	0.805	7-class	212.882	0.115	42467.219	42786.847	42596.242	0.801
8-class	218.798	0.190	41841.622	42326.391	42037.307	0.804	8-class	124.032	0.471	486175.864	42711.687	42498.845	0.810

Solution(s) considered "best-fitting" indicated in bold

Results

Table 2 Growth parameters for the selected 5-class model

Class Label (class size*)	Domain	Videogames			Surfing/chatting			TV/DVDs		
	Parameter	Intercept	Linear	Quadratic	Intercept	Linear	Quadratic	Intercept	Linear	Quadratic
Class 1 low-screen use (37.6%)	Estimate	0.56	0.27	−0.70	0.39	2.05	−0.59	1.02	1.13	−0.84
	SE	0.04	0.14	0.14	0.04	0.21	0.18	0.05	0.16	0.16
Class 2 increasing chatting/surfing (24.0%)	Estimate	0.95	1.10	−1.91	0.79	4.84	−2.69	1.74	2.36	−2.31
	SE	0.11	0.40	0.43	0.09	0.37	0.33	0.15	0.31	0.30
Class 3 moderate-screen use (18.6%)	Estimate	1.19	0.72	−0.11	0.55	1.92	−0.41	1.42	1.14	−1.15
	SE	0.07	0.31	0.32	0.06	0.25	0.24	0.09	0.27	0.25
Class 4 early-adolescence screen use (9.9%)	Estimate	2.41	−0.06	−1.79	2.30	0.67	−0.23	2.63	0.81	−1.44
	SE	0.19	0.84	0.77	0.28	1.02	0.78	0.11	0.52	0.44
Class 5 increasing videogame and chatting/surfing (9.9%)	Estimate	1.68	1.93	−0.35	1.03	2.76	−1.22	1.87	1.64	−2.19
	SE	0.13	0.47	0.42	0.12	0.52	0.48	0.15	0.48	0.43

*Based on estimated posterior probabilities

Results

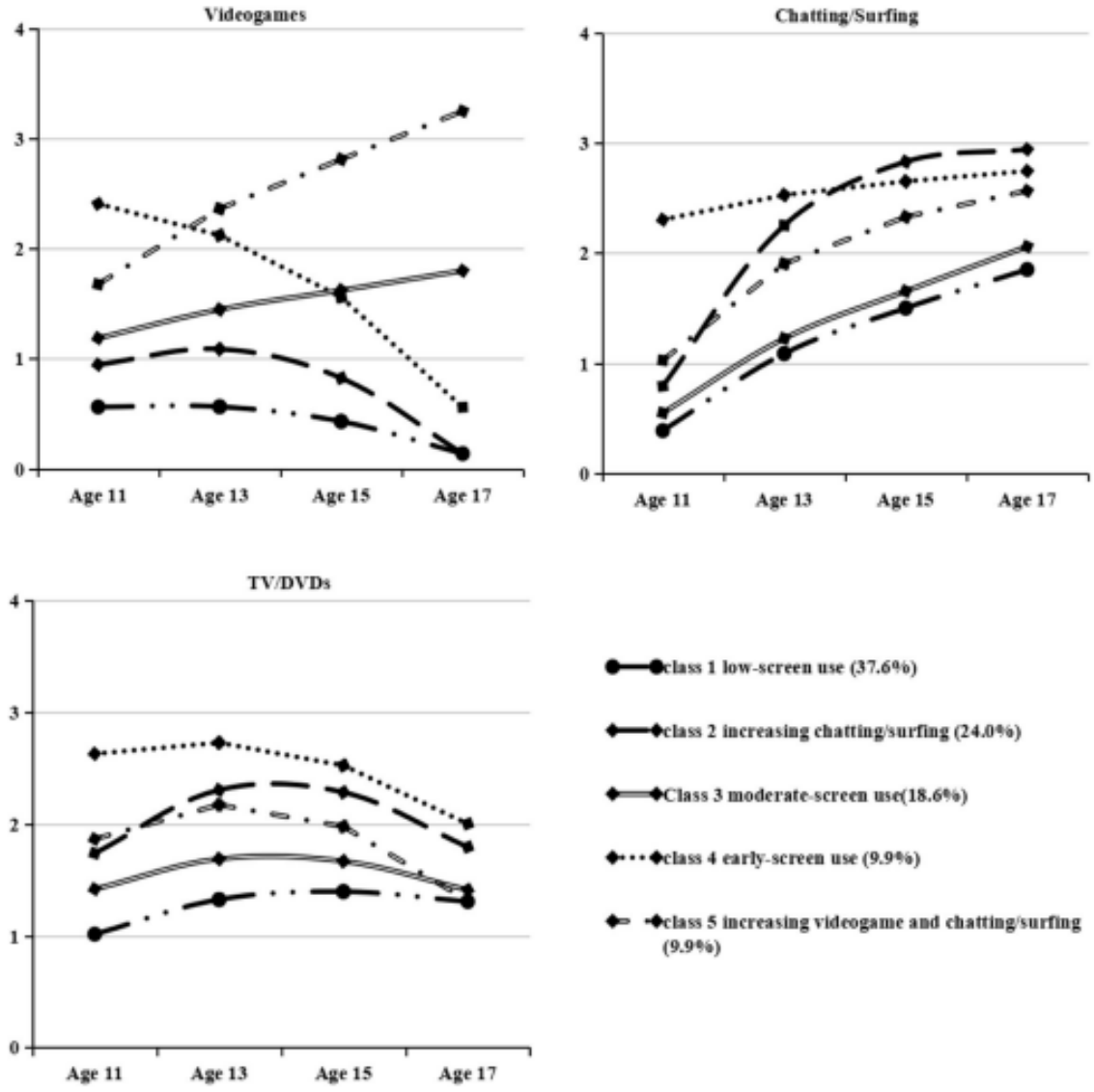


Fig. 2 5-class model of screen time on videogames, chatting/surfing, and TV/DVDs. The values on the vertical axis represent the number of hours per day, with 4 = more than 3 h per day

Results

Table 3 Comparison of age 20 outcomes (Adjusting for baseline level)

Age 20 outcomes	Outcome means (SE) by class				
	low-screen use (c1)	increasing chatting/surfing (c2)	moderate-screen use (c3)	early-adolescence screen use (c4)	increasing videogame and chatting/surfing (c5)
Outcomes' mean at age 20					
Depression (range: 1–5)	2.36 (0.05)	2.60 (0.07)	2.38 (0.12)	2.23 (0.05)	2.42 (0.09)
Anxiety (range: 1–5)	2.42 (0.05)	2.76 (0.08)	2.06 (0.06)	2.31 (0.12)	2.28 (0.09)
Self-injury (range: 1–5)	1.12 (0.02)	1.10 (0.03)	1.07 (0.03)	1.19 (0.07)	1.29 (0.08)
Suicidal ideation (range: 1–5)	1.27 (0.04)	1.34 (0.06)	1.23 (0.04)	1.27 (0.10)	1.53 (0.10)
Aggression (range: 1–5)	1.33 (0.02)	1.49 (0.03)	1.43 (0.03)	1.58 (0.06)	1.55 (0.05)
Tobacco use (range: 1–6)	3.22.(0.11)	4.11 (0.14)	3.66 (0.15)	4.60 (0.20)	3.62 (0.22)
Cannabis use (range: 1–6)	2.40 (0.09)	2.34 (0.13)	2.92 (0.14)	2.95 (0.22)	2.57 (0.18)
Delinquency (range: 0–7)	0.78 (0.05)	0.83 (0.07)	1.12 (0.07)	1.12 (0.14)	0.90 (0.11)

Results

Table 3 Comparison of age 20 outcomes (Adjusting for baseline level)

Age 20 outcomes	Outcome means (SE) by class				
	low-screen use (c1)	increasing chatting/surfing (c2)	moderate-screen use (c3)	early-adolescence screen use (c4)	increasing videogame and chatting/surfing (c5)
Standardized residuals after adjusting for baseline levels of outcomes					
Depression	-0.03 (0.06)	0.24 (0.10)	-0.17 (0.07)	-0.09 (0.16)	-0.02 (0.12)
Anxiety	0.02 (0.06)	0.38 (0.10)	-0.40 (0.07)	-0.18 (0.16)	0.00 (0.13)
Self-injury	-0.01 (0.05)	-0.05 (0.07)	-0.10 (0.02)	0.04 (0.02)	0.35 (0.02)
Suicidal ideation	-0.05 (0.05)	0.03 (0.09)	-0.07 (0.06)	-0.03 (0.15)	0.27 (0.14)
Aggression	-0.24 (0.05)	0.22 (0.08)	0.03 (0.09)	0.18 (0.19)	0.31 (0.16)
Tobacco use	-0.19 (0.06)	0.12 (0.07)	0.07 (0.08)	0.27 (0.12)	0.04 (0.12)
Cannabis use	-0.10 (0.05)	-0.09 (0.08)	0.20 (0.08)	0.17 (0.13)	0.05 (0.12)
Delinquency	-0.10 (0.05)	-0.04 (0.09)	0.27 (0.09)	-0.11 (0.17)	0.04 (0.15)

Table 3 Comparison of age 20 outcomes (Adjusting for baseline level)

Wald test *p* value	c1 vs. c2	c1 vs. c3	c1 vs. c4	c1 vs. c5	c2 vs. c3	c2 vs. c4	c2 vs. c5	c3 vs. c4	c3 vs. c5	c4 vs. c5
Depression	0.030*	0.139	0.735	0.893	**0.001****	0.099	0.095	0.647	0.268	0.710
Anxiety	**0.003****	**<0.001*****	0.241	0.885	**<0.001*****	**0.005****	0.016*	0.222	0.008**	0.391
Self-injury	0.727	0.280	0.748	0.046*	0.580	0.635	0.037*	0.400	0.019*	0.187
Suicidal ideation	0.480	0.757	0.913	0.027*	0.331	0.736	0.139	0.797	0.025*	0.137
Aggression	**<0.001*****	0.013*	0.032*	**0.001****	0.138	0.887	0.612	0.473	0.151	0.625
Tobacco use	**0.002****	0.008**	**<0.001*****	0.084	0.621	0.317	0.563	0.161	0.843	0.181
Cannabis use	0.889	**0.002****	0.060	0.229	0.011*	0.128	0.327	0.826	0.305	0.520
Delinquency	0.628	**0.001****	0.933	0.384	0.016*	0.731	0.628	0.048*	0.227	0.500

Bonferroni adjusted α level = 0.005 (0.05/10). Bold values are statistically significant after Bonferroni's correction. Pairwise comparisons (Wald test) were conducted.

Limitations and Future Directions

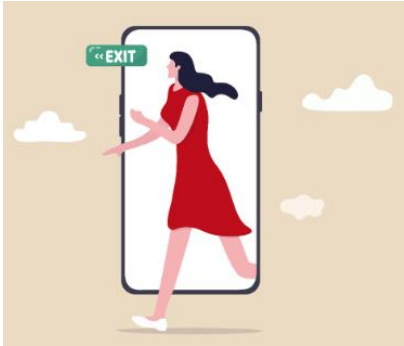
- Assessment relied on self-reports; objective measures like accelerometers are needed.
- Without assessing specific media content or purposes, hindering understanding of their association with outcomes.
- Examined the pathway from screen time to mental health
- Future research should use methods like experience sampling to record screen using to overcome recall biases.
- New media activities should be considered for understanding modern youth screen usage.

Conclusions

- ✓ Findings suggest that addressing screen time habits in adolescence, especially for those spending more time on certain screens, could help improve mental health and behavioural issues in adulthood but the current findings cannot inform direction of this association.

- ✓ These patterns can be used as markers to identify at-risk individuals who may benefit from screening.

- ✓ More research is needed to explore bidirectional associations between screen time and outcomes and consider broader developmental contexts.



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Thank you !