ACTA MÉDICA PORTUGUESA
A Revista Científica da Ordem dos Médicos

Guideline Recommendations and Estimates of Excessive Screen Time in Children

Recomendações de Normas e Estimativas de Excesso de Tempo de Ecrã em Crianças

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Acta Med Port (In Press) ▪ https://doi.org/10.20344/amp.24635

ABSTRACT

Even though digital media use in early childhood has increased, compliance estimates vary depending on the screen time guideline applied. This study compared Portuguese, World Health Organization, and American Academy of Pediatrics recommendations within the same population, and examined factors associated with exceeding age-specific limits. Baseline data from 940 children aged two to six years (mean 4.67 ± 1.03; 52.8% boys) were analyzed. The mean daily screen time was 126 minutes. The exceedance prevalence and severity were classified according to each framework. Most children exceeded recommendations across all systems, with highest prevalence and severity under the Portuguese Society of Neuropediatrics, followed by the American Academy of Pediatrics and the World Health Organization. Despite systematic reclassification across guidelines, consistent determinants emerged: earlier age at first exposure (ORs ranging between 0.93 - 0.98), child Internet use (non-use: ORs between 0.06 - 0.38), higher maternal screen time (ORs between 1.02 - 1.04), and bedroom device access (ORs between 0.17 - 0.50) were associated with higher odds of exceeding limits. Parental awareness of recommendations was generally high, but quantitative restrictions were less consistently implemented. The findings suggest that prevalence estimates strongly depend on the guideline framework applied, while family-level determinants of excessive exposure remain stable across classification systems.

Keywords: Child; Guidelines; Health Knowledge, Attitudes, Practice; Screen Time

RESUMO

Apesar do aumento da utilização de meios digitais na primeira infância, as estimativas de cumprimento variam consoante as recomendações de tempo de ecrã utilizadas. Este estudo comparou as recomendações portuguesas, da Organização Mundial da Saúde e da *American Academy of Pediatrics* na mesma população, analisando ainda os fatores associados ao excesso de ecrã, considerando os limites específicos para a idade. Foram analisados dados de *baseline* de 940 crianças com idades entre os dois e os seis anos (média 4,67 ± 1,03; 52,8% rapazes). O tempo médio diário de ecrã foi de 126 minutos. A prevalência e a gravidade do excesso de ecrã foram classificadas de acordo com cada norma. A maioria das crianças ultrapassou as recomendações em todos os sistemas, observando-se uma classificação de maior prevalência e gravidade nas recomendações da Sociedade Portuguesa de Neuropediatria, seguidas pela *American Academy of Pediatrics* e pela Organização Mundial da Saúde. Apesar da reclassificação sistemática entre recomendações, identificaram-se determinantes consistentes: a idade mais precoce na primeira exposição [*Odds Ratios* (OR) variando entre 0,93 – 0,98), a utilização da *Internet* pela criança (não utilização: ORs entre 0,06 – 0,38), o maior tempo de ecrã materno (ORs entre 1,02 – 1,04) e a ausência de dispositivos no quarto (ORs entre 0,17 – 0,50) foram associados de forma consistente à probabilidade de ultrapassar os limites definidos. De forma geral, o conhecimento parental sobre as recomendações foi elevado, embora a implementação de restrições quantitativas tenha sido menos consistente. Os resultados sugerem que as estimativas de prevalência dependem fortemente das normas utilizadas, enquanto os determinantes familiares da exposição excessiva permanecem estáveis entre sistemas de classificação.

Palavras-chave: Conhecimentos, Atitudes e Prática em Saúde; Criança; Directrizes; Tempo de Ecrã

Digital device use in childhood has increased globally, and excessive exposure has been associated with adverse health and developmental outcomes.[1-3] Although international organizations broadly recommend limiting screen use in early childhood,[4] differences in age thresholds and operational definitions may substantially influence compliance estimates. In 2025, the Portuguese Society of Neuropediatrics (SPNP) issued national recommendations that are more restrictive than those of the World Health Organization (WHO) and the American Academy of Pediatrics (AAP) in certain age groups.[5]

This study compared compliance and severity of exceedance across these frameworks within the same population and examined associated sociodemographic and family determinants.

Baseline data from the ScreenHealth cohort (https://screenhealth.uc.pt/) were cross-sectionally analyzed. Parents of children attending 60 preschools in the Coimbra region participated between April and June 2024 (participation rate 45%). Eligible participants were parents of preschool children attending these institutions. Screen use was parent-reported using a structured questionnaire adapted for the study. Of 1050 respondents, 940 children (52.8% boys; mean age 4.67 ± 1.03 years) had complete data on screen use. Parents reported daily screen use across television, computers, videogame consoles, smartphones, and tablets.

Exceedance was classified according to age-specific thresholds defined by the SPNP, WHO, and AAP (Appendix 1: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/24635/15969). According to the WHO and

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Revisto por/*Reviewed by*: Inês Vaz Silva.
Recebido/*Received*: 18/02/2026 - **Aceite/*Accepted*:** 05/05/2026 - **Publicado *Online*/*Published Online*:** 15/06/2026

AAP guidelines, which do not specify limits for older children, excess screen time was defined as ≥ 2 hours/day based on evidence of increased health risks above this threshold.[6] Severity was categorized as just above (1 - 2 times the limit), moderately high (2 - 3 times), and high/extreme (> 3 times). Additional variables included age at first exposure (in months), child Internet use ("no" *versus* "yes"), presence of bedroom devices (0 *vs* ≥ 1), and parental screen time (minutes/day). Multinomial logistic regression examined factors associated with exceeding recommendations.

Mean total screen time was 126.2 ± 74.8 minutes/day; including 74.5 ± 43.3 minutes/day of television and 27.4 ± 33.8 minutes/day of smartphone use. Children of mothers with lower educational attainment had higher screen time (139.9 min/day) compared to children of mothers with a university degree (115.6 min/day), $t(912) = 4.94$, $p < 0.001$. Similar results were found for father educational level (below university: 136.2 min/day; university: 109.7 min/day), $t(869) = 5.52$, $p < 0.001$. The mean age at first exposure was 14.6 months, occurring earlier among children of fathers with lower educational attainment (13.9 *vs* 15.1 months; $p = 0.02$), with no differences by maternal education. Most children used the Internet (64.3%), and 17.9% had at least one device in the bedroom. Both Internet use and presence of bedroom devices were more frequent among children of parents with lower education (all $p < 0.001$).

A substantial proportion of children exceeded recommendations across all frameworks, although prevalence and severity differed systematically (Table 1). Exceedance was highest under SPNP guidelines, particularly among children aged 4 - 6 years, where most were classified in the moderate (19.7%) or high/extreme (62.8%) categories. In contrast, the WHO criteria yielded the lowest prevalence and milder severity distribution, with exceedance largely concentrated in the just-above category (1 - 4 years: 37.6%; 5 - 17 years: 39.1%). The AAP classifications fell between these two frameworks. No differences were observed by sex (all $p > 0.05$). Lower parental education was consistently associated with greater exceedance across all guidelines (p-values ranging from < 0.001 to 0.03). Cross-framework comparisons showed consistent reclassification toward severity under WHO and AAP relative to SPNP, demonstrating a clear hierarchy of stringency (SPNP>AAP>WHO; all χ^2 tests $p < 0.001$).

Despite differences in classification, determinants of exceedance were consistent across frameworks (Table 2). Child Internet use emerged as one of the strongest correlates, with non-users showing substantially lower odds of exceeding recommendations across all frameworks (SPNP: OR = 0.09, 95% CI 0.03 - 0.22; WHO: OR = 0.07, 95% CI 0.02 - 0.19; AAP: OR = 0.06, 95% CI 0.03 - 0.15). An earlier age at first exposure was associated with higher odds of moderate and high exposure. The absence of bedroom devices was associated with reduced odds of exceedance; for example, under the AAP guidelines, children without bedroom devices had approximately 70% lower odds of high/extreme screen time compared with those with at least one device. Higher maternal screen time was consistently associated with greater odds of excessive exposure, particularly at higher severity levels. Child sex, siblings, and parental education were not independently associated.

Parental awareness of screen-related recommendations was generally high, although implementation was inconsistent. Alignment between knowledge and practice was strongest for co-viewing behaviors (71.7% of parents), whereas adherence to quantitative time limits was lower - particularly for avoidance of screen exposure in children under age 2 (Knowledge/No Practice: 51.8%; Knowledge/Practice: 36.3%) and restriction to 1h/day in early childhood (Knowledge/No Practice: 35.2%; Knowledge/Practice: 52.3%). Similar awareness of the AAP recommendation has been previously reported.[7]

These findings show that estimates of excessive screen time vary substantially depending on the guideline framework applied. The more restrictive SPNP recommendations identified higher prevalence and severity, whereas WHO guidelines resulted in systematic downgrading. Importantly, excessive exposure remained highly prevalent even under more permissive thresholds.[3,8,9] These differences reflect variation in guideline design rather than underlying behavior, with important implications for clinical interpretation and public health surveillance.

Determinants of exceedance were robust across frameworks. Early exposure, Internet-enabled use, parental modelling – particularly maternal screen time – and bedroom access were consistently associated with higher risk.[9,10] These findings suggest that family-level behavioral and environmental factors drive excessive exposure regardless of how thresholds are defined.

The observed knowledge–practice gap suggests that barriers to implementation, rather than lack of awareness, may drive non-compliance, underscoring the need for targeted family-based interventions.

This study's strengths include the direct comparison of national and international guidelines within the same sample and the use of a severity-based classification. However, some limitations include its cross-sectional design, reliance on parent-reported exposure, potential bias due to the participation rate, the limited data collection period, and lack of information on content quality and context of use.

In conclusion, the choice of guideline framework substantially alters estimates of prevalence and severity of excessive screen time in children. However, key family determinants remain stable across frameworks. Prevention strategies should prioritize delaying early exposure, limiting Internet-enabled use, promoting balanced parental modelling, and restricting bedroom device access. Interpretation of prevalence data should explicitly consider the guideline framework applied.

ACKNOWLEDGMENTS

The author sincerely thanks the respective school authorities for granting permission for data collection, the school teachers for serving as facilitators, and all the participating parents and children for their valuable contributions.

The author declares that no AI tools were used during the preparation of this work.

PROTECTION OF HUMANS AND ANIMALS

The author declares that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in October 2024.

ETHICS

The study was approved by the Ethics Committee of the Institute for Interdisciplinary Research, University of Coimbra (CEIIIUC; REF 1_ID312, 26 July 2023) and was conducted in accordance with national protection regulations, with support from the university's Data Protection Officer. Written informed consent was obtained from all parents prior to data collection.

DATA CONFIDENTIALITY

The author declares having followed the protocols in use at their working center regarding patients' data publication.

CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

FUNDING SOURCES

This project is funded by Fundação para a Ciência e Tecnologia (FCT; REF 2022.07652.PTDC; https://screenhealth.uc.pt/). The author is supported by National Funds through FCT, under the Stimulus of Scientific Employment-Individual Support program (REF 2020.03966.CEECIND). Support is also provided by Centro de Investigação em Antropologia e Saúde (CIAS; REF UID/00283/2025; DOI https://doi.org/10.54499/UID/00283/2025).

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Table 1 – Distribution of children within and outside age-specific screen time recommendations, with levels of exceedance defined relative to each guideline

Age-specific recommendations		Within recommendation	Outside recommendations		
			Just above	Moderately high	High/Extreme
SPNP	0 - 3 y; n = 294	26 (8.8%)	149 (50.7%)	47 (16.0%)	72 (24.5%)
	4 - 6 y; n = 646	28 (4.3%)	85 (13.2%)	127 (19.7%)	406 (62.8%)
WHO	1 - 4 y; n = 564	164 (29.1%)	212 (37.6%)	121 (21.5%)	67 (11.9%)
	5 - 17 y; n = 376	187 (49.7%)	147 (39.1%)	35 (9.3%)	7 (1.9%)
AAP	0 - 5 y; n = 828	201 (24.3%)	313 (37.8%)	193 (23.3%)	121 (14.6%)
	6 - 12 y; n = 112	53 (47.3%)	47 (42.0%)	10 (8.9%)	2 (1.8%)

Percentages refer to the proportion within each age group. “Just above”: 1-2 times the age-specific guideline, “Moderately high”: 2-3 times the guideline, “High/Extreme”: more than 3 times the guideline.
SPNP: Portuguese Society of Neuropediatrics; WHO: World Health Organization; AAP: American Academy of Pediatrics.

Table 2 – Multinomial logistic regression analyses examining factors associated with exceeding age-specific screen time recommendations according to SPNP, WHO, and AAP guidelines

	SPNP (OR; 95% CI, *p*-value†)		
	Just above	**Moderately high**	**High/Extreme**
Sex (ref. girls)	1.04; 0.51 - 2.11	0.82; 0.39 - 1.72	0.84; 0.41 - 1.74
Age (years)	0.70; 0.47 - 1.05	**1.53; 1.01 - 2.31, 0.04**	**2.30; 1.53 - 3.44, < 0.001**
First use (months)	0.97; 0.93 - 1.01	**0.94; 0.90 - 0.98, 0.01**	**0.93; 0.89 - 0.97, 0.00**
Bedroom devices (ref. ≥ 1)	0.57; 0.07 - 4.94	0.32; 0.04 - 2.73	0.17; 0.02 - 1.36
Uses Internet (ref. yes)	**0.22; 0.09 - 0.57, 0.00**	**0.16; 0.06 - 0.41, < 0.001**	**0.09; 0.03 - 0.22, < 0.001**
Mother ST (min/day)	0.99; 0.98 - 1.01	1.01; 0.99 - 1.03	**1.02; 1.00 - 1.04, 0.03**
Father ST (min/day)	1.01; 0.99 - 1.02	1.01; 0.99 - 1.02	1.01; 0.99 - 1.03
Siblings (ref. yes)	1.29; 0.61 - 2.70	1.13; 0.52 - 2.46	1.03; 0.48 - 2.20
Mother educ. (ref. uni.)	0.98; 0.41 - 2.31	0.83; 0.33 - 2.04	0.96; 0.40 - 2.30
Father educ. (ref. uni.)	0.96; 0.43 - 2.13	1.21; 0.53 - 2.79	1.20; 0.53 - 2.70
	WHO (OR; 95% CI, *p*-value†)		
	Just above	**Moderately high**	**High/Extreme**
Sex (ref. girls)	0.98; 0.69 - 1.41	1.28; 0.77 - 2.11	0.77; 0.39 - 1.54
Age (years)	**0.75; 0.62 - 0.98, 0.00**	**0.52; 0.40 - 0.67, < 0.001**	**0.42; 0.29 - 0.60, < 0.001**
First use (months)	**0.96; 0.94 - 0.98, < 0.001**	**0.95; 0.91 - 0.98, 0.00**	1.01; 0.96 - 1.06
Bedroom devices (ref. ≥ 1)	**0.50; 0.28 - 0.89, 0.02**	0.48 ;0.23 - 1.02	**0.36; 0.14 - 0.89, 0.03**
Uses Internet (ref. yes)	**0.38; 0.26 - 0.55, < 0.001**	**0.25; 0.14 - 0.44, < 0.001**	**0.07; 0.02 - 0.19, < 0.001**
Mother ST (min/day)	**1.01; 1.00 - 1.02, 0.01**	**1.03; 1.02 - 1.04, < 0.001**	**1.04; 1.03 - 1.06, < 0.001**
Father ST (min/day)	**1.01; 1.00 - 1.01, 0.04**	**1.01; 1.00 - 1.02, 0.01**	1.00; 0.99 - 1.01
Siblings (ref. yes)	0.91; 0.63 - 1.32	0.84; 0.51 - 1.41	0.59; 0.29 - 1.19
Mother educ. (ref. uni.)	0.99; 0.65 - 1.54	1.38; 0.77 - 2.47	1.50; 0.68 - 3.30
Father educ. (ref. uni.)	1.09; 0.73 - 1.62	1.34; 0.77 - 2.35	1.33; 0.60 - 2.94
	AAP (OR; 95% CI, *p*-value†)		
	Just above	**Moderately high**	**High/Extreme**
Sex (ref. girls)	1.16; 0.79 - 1.72	0.99; 0.62 - 1.58	0.99; 0.54 - 1.80
Age (years)	1.00; 0.83 - 1.22	0.97; 0.77 - 1.22	1.07; 0.79 - 1.44
First use (months)	**0.96; 0.94 - 0.99, 0.00**	**0.96; 0.93 - 0.99, 0.00**	0.98; 0.94 - 1.02
Bedroom devices (ref. ≥ 1)	**0.35; 0.16 - 0.74, 0.01**	**0.32; 0.14 - 0.73, 0.01**	**0.29; 0.11 - 0.72, 0.01**
Uses Internet (ref. yes)	**0.32; 0.21 - 0.48, < 0.001**	**0.20; 0.12 - 0.33, < 0.001**	**0.06; 0.03 - 0.15, < 0.001**
Mother ST (min/day)	**1.02; 1.01 - 1.03, 0.00**	**1.03; 1.01 - 1.04, < 0.001**	**1.04; 1.03 - 1.06, < 0.001**
Father ST (min/day)	1.01; 1.00 - 1.01	**1.01; 1.00 - 1.02, 0.02**	1.01; 0.99 - 1.02
Siblings (ref. yes)	0.81; 0.54 - 1.21	0.74; 0.46 - 1.19	0.74; 0.40 - 1.36
Mother educ. (ref. uni.)	1.21; 0.75 - 1.95	1.33; 0.76 - 2.33	1.66; 0.83 - 3.31
Father educ. (ref. uni.)	0.76; 0.49 - 1.18	1.03; 0.61 - 1.74	1.15; 0.59 - 2.27

†: *p*-value added when significant ($p < 0.05$)
Reference category: within recommendations; Continuous variables: age, first use and parental ST; Categorical variables: sex (boys; girls), bedroom devices (0; ≥1), uses internet (no; yes), siblings (no; yes), mother/father education (below university; university); Bold denotes statistical significance.
OR: odds ratios; CI: 95% confidence intervals; ST: screen time; SPNP: Portuguese Society of Neuropediatrics, WHO: World Health Organization; AAP: American Academy of Pediatrics.